



Functional Skills consultation – Mathematics from MMSA¹

General comments about the consultation document

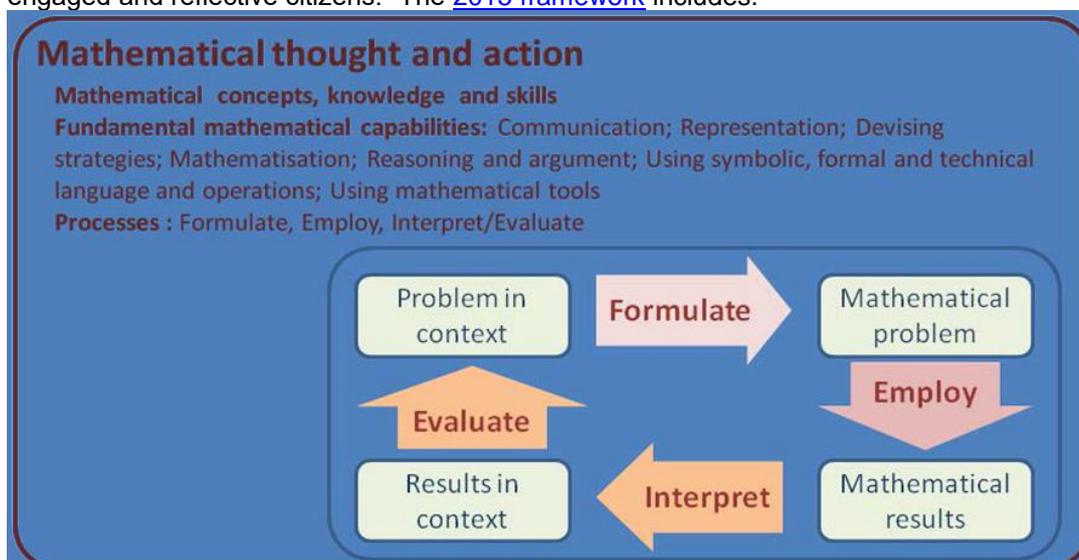
The statement “Mathematical problem solving is an important aspect of Functional Skills, but it is also vital that the underpinning knowledge and skills required can be demonstrated in their own right.” undermines the original purpose of Functional Skills which was about the ability to use mathematics to solve problems in everyday adult contexts. The consultation document refers to relevance to “the workplace” and fails to mention every day contexts, and further study for all levels of Functional Skills.

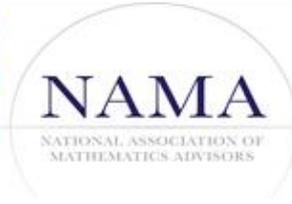
This emphasis on technical competence is stated in the purpose of Functional Skills: “Functional Skills qualifications should provide reliable evidence of a student’s achievements against demanding content that is relevant to the workplace. They need to provide assessment of students’ underpinning knowledge as well as their ability to apply this in different contexts, and to provide a foundation for progression into further study, or employment.” This represents a distortion and diminution of the original purpose, where students were expected to use their mathematical skills to solve problems in plausible adult contexts. Whilst skills development was important, there was no intention to assess the skills set per se. This shift is likely to result in less authentic assessment and result in an over emphasis on skill development during teaching.

The presentation of the content for each level with a list of mathematical content preceding problem solving and decision making is similarly unhelpful. The content would be better as indicative, expressed after the ability to solve problems in a variety of contexts. The content would be enhanced by explicit mention of practical skills e.g. use of measuring equipment

Throughout the content prescription, there is no mention of students selecting the mathematics to use to solve problems and interpreting the outcome of mathematical activity, these are serious omissions that represent a retrograde step from current Functional Skills in mathematics. Similarly, there is no mention of the use of calculators or mental methods. In modern society, it is far more likely that an adult will have access to technology rather than pencil and paper. It is vital that calculators and spreadsheets can be used ‘intelligently’, i.e. ensuring the correct calculation is entered and the answer is interpreted appropriately. This means that estimation, approximation and checking strategies are crucial. There is no mention of these essential skills in the draft specification.

Including the description of problem solving in A level assessments is wholly inappropriate for Functional Skills. The current Functional Skills was informed by the OECD’s PISA mathematisation process. PISA assesses mathematical literacy defined as “an individual’s capacity to formulate, employ, and interpret mathematics in a variety of contexts. It includes reasoning mathematically and using mathematical concepts, procedures, facts and tools to describe, explain and predict phenomena. It assists individuals to recognise the role that mathematics plays in the world and to make the well-founded judgments and decisions needed by constructive, engaged and reflective citizens.” The [2015 framework](#) includes:





Although the functional mathematics subject content builds on earlier standards such as the Adult Numeracy Core curriculum, it lacks any forward-thinking such as the use of new technologies. There is a lack of coherence with the Ofqual consultation on the framework for qualifications.

Throughout the document, multiplication has been indicated with x rather than \times - this is poor practice.

1. Does the proposed subject content cover the appropriate knowledge and understanding for Functional Skills in these subjects?

See detail below

The specification states ‘they enable the student to gain confidence and fluency’ and each level of the qualification ‘subsumes and builds upon content at lower levels’. There is also reference to building a ‘positive attitude towards mathematics’.

There are some elements within the standards which rely solely upon memory skills which do little to develop confidence and fluency. It is also very difficult to see where in any standard there are opportunities to develop a ‘positive attitude’ towards mathematics.

2. At Entry levels: Does the content cover the key elements of literacy and numeracy needed to support students to progress to higher levels of study in English and mathematics?

Whilst there is progression from one level to the next, the jump from Entry levels to level 1 is huge. There is little progression in the application and problem solving elements, which should precede the detailed content. All the content should be worked on in appropriate contexts.

We have made specific points about the content below.

Specific points

Entry 1 – element 1 the numbers to 10 would be more appropriate or whole numbers with one significant figure (i.e. counting in tens, hundreds, thousands). The numbers 11-20 are particularly difficult for students to learn given the irregular language.

Entry 1 – element 9 A square is a rectangle so “rectangle (including square)” might be preferable to “rectangle, square” – which suggests the common misconception that these are distinct.

Entry 1 – element 13 includes pictograms. Pictograms usually include a key whereby a picture represents multiple amounts – this is beyond Entry 1 and needs to be removed.

Entry 2 – elements 1-3 There seems to be confusion between the numbers students are supposed to be able to work with – up to 50 and up to 200 are both mentioned. 100 would be more appropriate at this level.

Entry 2 – elements 4-7 There needs to be mention of how the arithmetic operations are connected (e.g. addition and subtraction are inverse operations; multiplication and division similarly; multiplication is repeated addition). Students working at this level may have serious challenges in ‘memorising’, consequently building confidence and understanding is crucial so students can use what they know to figure out things for themselves. Division with remainders is inappropriate at this level. There should be mention of the use of mental methods of calculation and use of calculators.



Entry 2 – element 6 Why multiplication tables to 12×12 ? This seems arbitrarily unnecessary given decimalisation. Confidence and understanding of multiplication facts for 2, 3, 5 and 10, allows others to be derived. We recognise the link to the primary school National Curriculum – but why is this relevant to functional skills for adults?

Entry 2 – element 10 ‘recognise’ is not clear in its meaning – is it about being to read a decimal or ‘approximate by rounding’ as per element 8

Entry 2 – element 14 Grams and kilograms are units of mass, not ‘weight’. While many adults will understand Imperial measures such as pints and miles, this will not be appropriate to all and not helpful at this level.

Entry 2 – elements 18-19 The language of shape is incorrect – vertex should be used rather than ‘corner’ which can lead to misconceptions, particularly when looking at 3-D shapes.

Entry 2 – element 24 Taking information from one format and expressing in another format is also inappropriate at entry 2 – extracting relevant information is hard enough.

Entry 3 – element 3 Division of a three-digit number by a two-digit number seems wholly inappropriate unless it is with a calculator.

Entry 3 – element 9 ‘recognise and continue with fractions and decimals and place in sequence’ does not make sense. It is important that students understand that fractions and decimals are different representations of the same thing.

Entry 3 – element 14 Mass is probably intended rather than weight, Imperial measures should only be introduced in everyday contexts with the use of a calculator. Suggest Imperial measures are best moved to level 1.

Entry 3 – element 16 “sort 2-D and 3-D shapes using properties including lines of symmetry, length, right angles, angles including in rectangles and triangles”

This seems very cumbersome and appears to address two topics in one sentence. Is it just about sorting or is it also about angles?

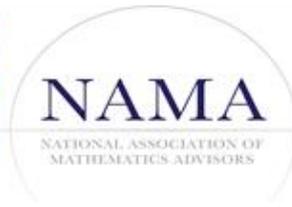
3. At Levels 1 and 2: Does the content cover the key elements of literacy and numeracy needed for employment?

General comment - The question is only related to use in employment and not everyday life.

We propose that the application and problem solving detail should precede the detailed content. The content should be worked on in appropriate contexts. The complex problem solving at levels 1 and 2 may be compromised by the literacy ability required to understand different contexts.

In the Level 2 solving problems and decision-making section the first point is for students to read, understand and use mathematical information and mathematical terms, but they also need to be able to extract appropriate information to solve problems in different contexts. Arguably, this is just as important as being able to do the calculations and should be near the beginning of the list rather than hinted at in the final sentence.

The content focuses on important skills such as calculating and using percentages, which are important in any life context, but the mathematics content has limited application of new technologies. New technologies are a significant element of employment and everyday life. There is no mention of types of software or technology that may be useful. Students should be able to use calculators and spreadsheets as mathematical tools. We have made specific points about the content below.



Specific points

Level 1 – elements 1,7,11 this is a massive step from Entry 3 – numbers to 1 million, precedence of operations (not BIDMAS – this should not be mentioned in an official document, even if it is a draft for consultation purposes) – suggest this could be use of brackets to clarify arithmetic expressions with more than one operator. There is no mention of mental methods as a first resource or use of a calculator. Multiplying and dividing decimals with 2 d.p. seems inappropriate, as does ratio and proportion.

Level 1 – element 16 – what does ‘recognise’ mean? Does it mean memorisation of particular equivalences or understanding how to work out fraction, decimal, percentage equivalences? Suggest ‘understand and calculate’ would be preferable.

Level 1 – elements 18-24 again, weight is probably mass. Everyday Imperial measures could be mentioned here. Note that cubes are cuboids.

Level 1 – elements 22 & 23 recommend adding ‘understand’ before calculating area and volume respectively

Level 1 – elements 27-31 displaying grouped discrete data seems overly prescriptive and inappropriate at this level. Why mean and range? Suggest mean, median, mode as measures of central tendency (‘average’). Range is a measure of spread and would be better mentioned separately.

Level 2 – element 4 ‘identify and know’ is not appropriate, students need to be able to use a calculator to convert between fractions, decimals and percentages which is important at this level.

Level 2 – element 10 why do students need to be able to add, subtract, multiply and divide decimals with 3 d.p.? – this would be appropriate with a calculator, although this is not mentioned.

Level 2 – element 11 inverse proportion seems inappropriate.

Level 2 – element 14 density seems unnecessary.

Level 2 – element 15&16 why can’t students be given formulae for area and perimeters? – this would be much more realistic than expecting them to be memorised. Functional Skills are meant to be about preparing people for real life! the word ‘find’ appears to be used as a synonym for ‘determine’ or ‘calculate’. The word ‘find’ has that issue of other non-mathematical meanings that is known to add some ambiguity.

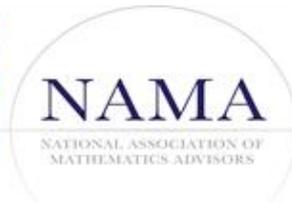
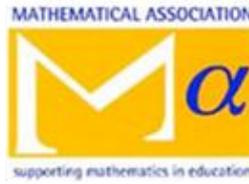
Level 2 – elements 21-25. At level 2, students should be able to select appropriate statistics to compare data sets rather than be told which ones to use.

There is some concern about putting range along with mean, mode and median without pointing out it is a different thing. Suggest ‘statistical measures such as average (mean, median and mode) and spread (range)’

Level 2 element 26, covers a broad spectrum of skills ‘to draw and interpret scatter diagrams and recognise positive and negative correlation’. However, it does not ask any questions about the reliability of the data or the validity of the ‘apparent’ link between the variables. Knowing whether the findings are valid is an important part of data interpretation in any context. Correlation does not imply causality.

4. At Levels 1 and 2: Will the proposed qualifications secure sound progression for the purposes of progression into further study?

General comment - The functional mathematics subject content builds on earlier standards such as the Adult Numeracy Core curriculum and the school curriculum. However, it could be argued it has moved too close to the school curriculum with a focus on technical competence above application and problem solving. Whilst the preamble mentions completing patterns, this is not mentioned explicitly in the content.



5. Does the proposed subject content provide assurance that essential knowledge taught in earlier levels is built upon and represented adequately?

No specific comment here.

6. Do any of the proposals have potential to have a disproportionate impact, positive or negative, on specific student groups, in particular the 'protected characteristic' groups? (The protected characteristics are age, disability, gender reassignment, race, religion or belief, sex, sexual orientation, marriage and civil partnership, and pregnancy and maternity); if they have potential for an adverse impact, how can this be reduced?

The choice of contexts can always be problematic. The content at Entry level suggests that the 'context for simple problems at this level should be familiar to all students'. In reality, this is not possible. Even where you might have a relatively universal activity [e.g. shopping] it is experienced differently by people and so tasks won't necessarily be 'familiar'. Of course, what is wanted is something *reasonably* universal and familiar with strategies for how to assist all potential candidates. For example, through the use of pre-release material. There are some relatively well-known concerns about cultural artefacts which may or may not be familiar in the context of probability [e.g. playing cards, dice] and the difficulties of choosing sports that are universally appreciated. For some learners e.g. asylum seekers, young offenders some of the popular contexts for Functional Skills assessments (e.g. planning a trip, gardening, shopping) are not relevant.

ⁱ The Meeting of Mathematics Subjects Associations (MMSA) is a Special Interest Group of the Joint Mathematical Council of the United Kingdom*, whereby the five classroom facing Mathematics Subject Associations (the Association of Mathematics Education Teachers (AMET), the Association of Teachers of Mathematics (ATM), the National Association for Mathematics and Numeracy in Colleges (NANAMIC), the National Association of Mathematics Advisers (NAMA) and the Mathematical Association (MA)) meet termly to collaborate and discuss issues of shared concern.

*The Joint Mathematical Council of the United Kingdom is a Charitable Incorporated Organisation, registered with the Charity Commission for England and Wales, Registered Charity Number: 1171223; Registered Office: De Morgan House, 57-58 Russell Square, London, WC1B 4HS.