Ma

KEY STAGE 2

YEARS 3–6

2016

National curriculum assessments

Key stage 2 mathematics test framework (draft)

National curriculum tests from 2016

For test developers

Standards & Testing Agency

2016 Key stage 2 mathematics test framework: national curriculum tests from 2016
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Contents

1. Overview

This test framework is based on the national curriculum programme of study (2014) for mathematics, introduced for teaching in schools from September 2014 and first assessed in summer 2016. The framework specifies the purpose, format, content and cognitive demand of the key stage 2 mathematics tests; it is not designed to be used to guide teaching and learning or to inform statutory teacher assessment.

This document has been produced to aid the test development process and is therefore draft at this stage. Although any changes are expected to be minor, the document will be updated as required following evidence from trialling the tests. The document will be finalised and published on the Department for Education's (DfE's) website in advance of full sample test materials being released for schools in summer 2015.

1.1 Purposes of statutory assessment

The main purpose of statutory assessment is to:

- ascertain what children have achieved in relation to the attainment targets outlined in the national curriculum (2014) in mathematics.

The main intended uses of the outcomes as set out in the Bew Report[1] and the Government's consultation document on primary assessment and accountability are to:

- hold schools accountable for the attainment and progress made by their children
- inform parents and secondary schools about the performance of individual children
- enable benchmarking between schools, as well as monitor performance locally and nationally.

1 Independent review of key stage 2 testing, assessment and accountability (2011), Lord Bew. https://media.education.gov.uk/MediaFiles/C/C/0/%7BCC021195-3870-40B7-AC0B-66004C329F1F%7DIndependent%20review%20of%20KS2%20testing,%20final%20report.pdf

2. What is a test framework?

The purpose of the test framework is to provide the documentation to guide the development of the tests. The framework is written primarily for those who write test materials and to guide subsequent development and test construction. It is being made available to a wider audience for reasons of openness and transparency; it is not designed to be used to guide teaching and learning or to inform statutory teacher assessment.

Some elements of the statutory national curriculum are not possible to assess using the current form of testing; they will need to be assessed by teachers as part of their statutory assessment of the complete national curriculum.

The framework includes those parts of the programme of study as outlined in the national curriculum (2014) that will be covered in the test (the 'content domain'). The cognitive processes considered central to the mathematics tests are also detailed in the cognitive domain.

Also included in the test framework is a test specification from which valid, reliable and comparable tests can be constructed each year. This includes specifics about test format, question types, response types and marking as well as a clear test-level reporting strategy.

By providing all of this information in a single document, the test framework answers questions about what the test will cover, and how, in a clear and concise manner. The framework does not provide information on how teachers should teach the national curriculum.

The test development process used by the Standards and Testing Agency (STA) embeds within it the generation of validity and reliability evidence through expert review and trialling. Given the nature of the evidence collected it is not anticipated that any additional studies will be required in order to demonstrate that the tests are fit for purpose. The test framework does not provide detail of the validity and reliability of individual tests; this will be provided in the test handbook which will be published on the DfE's website following the administration of the test.

The test framework should be used in conjunction with the national curriculum (2014) and the annual 'Assessment and reporting arrangements' (ARA) document.

3. Nature of the test

The key stage 2 mathematics test forms part of the statutory assessment arrangements for children at the end of key stage 2.

The test is based on the relevant sections of the national curriculum (2014) statutory programme of study for mathematics at key stage 2.

The mathematics test will cover the aspects of the national curriculum that lend themselves to paper-based externally-marked testing.

3.1 Population to be assessed

All eligible children who are registered at maintained schools, special schools, or academies (including free schools) in England and are at the end of key stage 2 will be required to take the key stage 2 mathematics test, unless they have taken it in the past. Independent schools may choose to participate in the statutory assessment arrangements on a year by year basis.

Some children are exempt from the tests. Further details are in the ARA.

3.2 Test format

The mathematics test is comprised of two components, which will be presented to children as three separate test papers. The first component is an arithmetic paper. The second component is administered as two papers; there are no significant differences in format between the two papers. The test is administered on paper and the total testing time is 110 minutes.

Table 1: Format of the test

Component	Description	Number of papers	Number of marks	Timing of component
Paper 1	Arithmetic	1	30	30 minutes
Paper 2 and Paper 3	Mathematical fluency, solving problems and reasoning	2	80 overall 40 per paper	80 minutes 40 minutes per paper
	Total	**3**	**110**	**110 minutes**

3.3 Resource list

The resource list for the mathematics tests comprises: pencil / black pen, eraser, ruler (mm and cm), angle measurer / protractor and mirror. Children will not be permitted to use a calculator in any of the components.

3.4 Provision of formulae

The Year 6 national curriculum states that children need to 'recognise when it is possible to use formulae for area and volume of shapes'.

Formulae will be provided where relevant within a question to allow children to calculate with them as necessary.

4. Content domain

The content domain draws out the relevant elements from the national curriculum (2014) programme of study for mathematics at key stage 2 that are assessed in the mathematics test. The tests will, over time, sample from each area of the content domain.

The content domain also identifies elements of the programme of study that cannot be assessed in the key stage 2 tests (section 4.3). Attainment in these elements will be monitored through teacher assessment.

The following tables detail content from the national curriculum (2014). Elements from the curriculum are ordered to show progression across the years. The curriculum has been grouped into subdomains and these are detailed in the strand column.

4.1 Content domain referencing system

A referencing system is used in the content domain to indicate the year, the strand and the sub-strand, for example '3N1' equates to:

- year - 3
- strand - Number, place value, approximation and estimation / rounding
- sub-strand - 1

Table 2 shows the references for the strands and sub-strands and table 3 shows the progression across the years.

Table 2: Content domain strands and sub-strands

Strand	Sub-strand	Reference
Number and place value, approximation and estimation / rounding	Counting (in multiples)	**N1**
	Read, write, order and compare numbers	**N2**
	Place value; Roman numerals	**N3**
	Identify, represent and estimate; rounding	**N4**
	Negative numbers	**N5**
	Number problems	**N6**

Strand	Sub-strand	Reference
Addition, subtraction, multiplication and division (calculations)	Add / subtract mentally	**C1**
	Add / subtract using written methods	**C2**
	Estimate, use inverses and check	**C3**
	Add / subtract to solve problems	**C4**
	Properties of number (multiples, factors, primes, squares and cubes)	**C5**
	Multiply / divide mentally	**C6**
	Multiply / divide using written methods	**C7**
	Solve problems (commutative, associative, distributive and all four operations)	**C8**
	Order of operations	**C9**
Fractions, decimals and percentages	Recognise, find, write, name and count fractions	**F1**
	Equivalent fractions	**F2**
	Comparing and ordering fractions	**F3**
	Add / subtract fractions	**F4**
	Multiply / divide fractions	**F5**
	Fractions / decimals equivalence	**F6**
	Rounding decimals	**F7**
	Compare and order decimals	**F8**
	Multiply / divide decimals	**F9**
	Solve problems with fractions and decimals	**F10**
	Fractions / decimal / percentage equivalence	**F11**
	Solve problems with percentages	**F12**
Ratio and proportion	Relative sizes, similarity	**R1**
	Use of percentages for comparison	**R2**
	Scale factors	**R3**
	Unequal sharing and grouping	**R4**

Strand	Sub-strand	Reference
Algebra	Missing number problems expressed in algebra	**A1**
	Simple formulae expressed in words	**A2**
	Generate and describe linear number sequences	**A3**
	Number sentences involving two unknowns	**A4**
	Enumerate all possibilities of combinations of two variables	**A5**
Measurement	Compare, describe and order measures	**M1**
	Estimate, measure and read scales	**M2**
	Money	**M3**
	Telling time, ordering time, duration and units of time	**M4**
	Convert between metric units	**M5**
	Convert metric/imperial	**M6**
	Perimeter, area	**M7**
	Volume	**M8**
	Solve problems (a, money; b, length; c, mass / weight; d, capacity / volume)	**M9**
Geometry – properties of shapes	Recognise and name common shapes	**G1**
	Describe properties and classify shapes	**G2**
	Draw and make shapes and relate 2–D to 3–D shapes (including nets)	**G3**
	Angles – measuring and properties	**G4**
	Circles	**G5**
Geometry – position and direction	Patterns	**P1**
	Describe position, direction and movement	**P2**
	Coordinates	**P3**
Statistics	Interpret and represent data	**S1**
	Solve problems involving data	**S2**
	Mean average	**S3**

4.2 Content domain for key stage 2 mathematics

Table 3: Content domain

Strand	National curriculum reference											
	Year 3			Year 4			Year 5			Year 6		
Number, place value, approximation and estimation / rounding	**3N1b**	Count from 0 in multiples of 4, 8, 50 and 100		**4N1**	Count in multiples of 6, 7, 9, 25 and 1000		**5N1**	Count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000				
	3N2a	Compare and order numbers up to 1000 Read and write numbers to 1000 in numerals and in words		**4N2a**	Order and compare numbers beyond 1000		**5N2**	Read, write, order and compare numbers to at least 1 000 000		**6N2**	Read, write, order and compare numbers up to 10 000 000	
	3N2b	Find 10 or 100 more or less than a given number		**4N2b**	Find 1000 more or less than a given number							
	3N3	Recognise the place value of each digit in a three-digit number (hundreds, tens, ones)		**4N3a**	Recognise the place value of each digit in a four-digit number (thousands, hundreds, tens and ones)		**5N3a**	Determine the value of each digit in numbers up to 1 000 000		**6N3**	Determine the value of each digit in numbers up to 10 000 000	
				4N3b	Read Roman numerals to 100 (I to C) and know that over time, the numeral system changed to include the concept of zero and place value		**5N3b**	Read Roman numerals to 1000 (M) and recognise years written in Roman numerals				
	3N4	Identify, represent and estimate numbers using different representations		**4N4a**	Identify, represent and estimate numbers using different representations							

Strand	National curriculum reference							
	Year 3		Year 4		Year 5		Year 6	
Number, place value, approximation and estimation / rounding (Continued)			**4N4b**	Round any number to the nearest 10, 100 or 1000	**5N4**	Round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000	**6N4**	Round any whole number to a required degree of accuracy
			4N5	Count backwards through zero to include negative numbers	**5N5**	Interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through zero	**6N5**	Use negative numbers in context, and calculate intervals across zero
	3N6	Solve number problems and practical problems involving **3N1–3N5**	**4N6**	Solve number and practical problems that involve **4N1–4N5** and with increasingly large positive numbers	**5N6**	Solve number problems and practical problems that involve **5N1–5N5**	**6N6**	Solve number problems and practical problems that involve **6N2–6N5**
Addition, subtraction, multiplication and division (calculations)	**3C1**	Add and subtract numbers mentally, including: • a three-digit number and ones • a three-digit number and tens • a three-digit number and hundreds			**5C1**	Add and subtract numbers mentally with increasingly large numbers		
	3C2	Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction	**4C2**	Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate	**5C2**	Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)		

Strand	National curriculum reference							
	Year 3		Year 4		Year 5		Year 6	
Addition, subtraction, multiplication and division (calculations) (Continued)	**3C3**	Estimate the answer to a calculation and use inverse operations to check answers	**4C3**	Estimate and use inverse operations to check answers to a calculation	**5C3**	Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy	**6C3**	Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy
	3C4	Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction	**4C4**	Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why	**5C4**	Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why	**6C4**	Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why
					5C5a	Identify multiples and factors, including finding all factor pairs of a number and common factors of two numbers	**6C5**	Identify common factors, common multiples and prime numbers
					5C5b	Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers		
					5C5c	Establish whether a number up to 100 is prime and recall prime numbers up to 19		
					5C5d	Recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3})		

Strand	National curriculum reference							
	Year 3		Year 4		Year 5		Year 6	
Addition, subtraction, multiplication and division (calculations) (Continued)	**3C6**	Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables	**4C6a**	Recall multiplication and division facts for multiplication tables up to 12 × 12	**5C6a**	Multiply and divide numbers mentally drawing upon known facts	**6C6**	Perform mental calculations, including with mixed operations and large numbers
			4C6b	Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers	**5C6b**	Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000		
			4C6c	Recognise and use factor pairs and commutativity in mental calculations				
	3C7	Write and calculate mathematical statements for multiplication and division using the multiplication tables that children know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods	**4C7**	Multiply two-digit and three-digit numbers by a one-digit number using formal written layout	**5C7a**	Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers	**6C7a**	Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication

Strand	National curriculum reference							
	Year 3		Year 4		Year 5		Year 6	
Addition, subtraction, multiplication and division (calculations) (Continued)					**5C7b**	Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context	**6C7b**	Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context
							6C7c	Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context
	3C8	Solve problems, including missing number problems, involving multiplication and division, including integer scaling problems and correspondence problems in which n objects are connected to m objects	**4C8**	Solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects	**5C8a**	Solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes	**6C8**	Solve problems involving addition, subtraction, multiplication and division

Strand	National curriculum reference			
	Year 3	Year 4	Year 5	Year 6
Addition, subtraction, multiplication and division (calculations) (Continued)			**5C8b** Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign	
			5C8c Solve problems involving multiplication and division including scaling by simple fractions and problems involving simple rates	
				6C9 Use their knowledge of the order of operations to carry out calculations involving the four operations
Fractions, decimals and percentages	**3F1a** Count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10	**4F1** Count up and down in hundredths; recognise that hundredths arise when dividing an object by a hundred and dividing tenths by ten		
	3F1b Recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators			

Strand	National curriculum reference							
	Year 3		Year 4		Year 5		Year 6	
Fractions, decimals and percentages (Continued)	**3F1c**	Recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators						
	3F2	Recognise and show, using diagrams, equivalent fractions with small denominators	**4F2**	Recognise and show, using diagrams, families of common equivalent fractions	**5F2a**	Recognise mixed numbers and improper fractions and convert from one form to the other; write mathematical statements >1 as a mixed number [eg: $\frac{2}{5} + \frac{4}{5} = \frac{6}{5} = 1\frac{1}{5}$]	**6F2**	Use common factors to simplify fractions; use common multiples to express fractions in the same denomination
					5F2b	Identify name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths		
	3F3	Compare and order unit fractions and fractions with the same denominators			**5F3**	Compare and order fractions whose denominators are all multiples of the same number	**6F3**	Compare and order fractions, including fractions >1
	3F4	Add and subtract fractions with the same denominator within one whole [eg: $\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$]	**4F4**	Add and subtract fractions with the same denominator	**5F4**	Add and subtract fractions with the same denominator and denominators that are multiples of the same number	**6F4**	Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions

Strand	National curriculum reference							
	Year 3		Year 4		Year 5		Year 6	
Fractions, decimals and percentages (Continued)					**5F5**	Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams	**6F5a**	Multiply simple pairs of proper fractions, writing the answer in its simplest form [eg: $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$]
							6F5b	Divide proper fractions by whole numbers [eg: $\frac{1}{3} \div 2 = \frac{1}{6}$]
			4F6a	Recognise and write decimal equivalents to $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$	**5F6a**	Read and write decimal numbers as fractions [eg: $0.71 = \frac{71}{100}$]	**6F6**	Associate a fraction with division to calculate decimal fraction equivalents (eg: 0.375) for a simple fraction [eg: $\frac{3}{8}$]
			4F6b	Recognise and write decimal equivalents of any number of tenths or hundredths	**5F6b**	Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents		
			4F7	Round decimals with one decimal place to the nearest whole number	**5F7**	Round decimals with two decimal places to the nearest whole number and to one decimal place		
			4F8	Compare numbers with the same number of decimal places up to two decimal places	**5F8**	Read, write, order and compare numbers with up to three decimal places		

Strand	National curriculum reference							
	Year 3		Year 4		Year 5		Year 6	
Fractions, decimals and percentages (Continued)			**4F9**	Find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths			**6F9a**	Identify the value of each digit to three decimal places and multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places
							6F9b	Multiply one-digit numbers with up to two-decimal places by whole numbers
							6F9c	Use written division methods in cases where the answer has up to two-decimal places
	3F10	Solve problems that involve **3F1–3F4**	**4F10a**	Solve problems involving increasingly harder fractions to calculate quantities and fractions to divide quantities, including non-unit fractions where the answer is a whole number	**5F10**	Solve problems involving numbers up to three decimal places	**6F10**	Solve problems which require answers to be rounded to specified degrees of accuracy
			4F10b	Solve simple measure and money problems involving fractions and decimals to two decimal places				

Strand	National curriculum reference			
	Year 3	Year 4	Year 5	Year 6
Fractions, decimals and percentages (Continued)			**5F11** Recognise the per cent symbol (%) and understand that per cent relates to 'number of parts per hundred'; write percentages as a fraction with denominator hundred, and as a decimal	**6F11** Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts
			5F12 Solve problems which require knowing percentage and decimal equivalents of $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{2}{5}$, $\frac{4}{5}$ and those fractions with a denominator of a multiple of 10 or 25	
Ratio and proportion				**6R1** Solve problems involving the relative sizes of two quantities, where missing values can be found by using integer multiplication and division facts
				6R2 Solve problems involving the calculation of percentages [eg: of measures such as 15% of 360] and the use of percentages for comparison
				6R3 Solve problem involving similar shapes where the scale factor is known or can be found

Strand	National curriculum reference			
	Year 3	Year 4	Year 5	Year 6
Ratio and proportion (Continued)				**6R4** Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples
Algebra				**6A1** Express missing number problems algebraically
				6A2 Use simple formulae
				6A3 Generate and describe linear number sequences
				6A4 Find pairs of numbers that satisfy an equation with two unknowns
				6A5 Enumerate possibilities of combinations of two variables
Measurement	**3M1a** Compare lengths (m/cm/mm)	**4M1** Compare different measures, including money in pounds and pence		
	3M1b Compare mass (kg/g)			
	3M1c Compare volume / capacity (l/ml)			
	3M2a Measure lengths (m/cm/mm)	**4M2** Estimate different measures, including money in pounds and pence		
	3M2b Measure mass (kg/g)			

Strand	National curriculum reference							
	Year 3		Year 4		Year 5		Year 6	
Measurement (Continued)	**3M2c**	Measure volume / capacity (l/ml)						
	M3	**Key stage 1 content domain**						
	3M4a	Tell and write the time from an analogue clock; 12-hour clocks	**4M4a**	Read, write and convert time between analogue and digital 12-hour clocks				
	3M4b	Tell and write the time from an analogue clock; 24-hour clocks	**4M4b**	Read, write and convert time between analogue and digital 24-hour clocks				
	3M4c	Tell and write the time from an analogue clock, including using Roman numerals from I to XII	**4M4c**	Solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days	**5M4**	Solve problems involving converting between units of time		
	3M4d	Estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes and hours; use vocabulary such as o'clock/a.m./p.m., morning, afternoon, noon and midnight						
	3M4e	Know the number of seconds in a minute and the number of days in each month, year and leap year						

Strand	National curriculum reference							
	Year 3		Year 4		Year 5		Year 6	
Measurement (Continued)	**3M4f**	Compare durations of events, [eg: to calculate the time taken by particular events or tasks]						
			4M5	Convert between different units of measurement [eg: kilometre to metre; hour to minute]	**5M5**	Convert between different units of metric measure [eg: kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre]	**6M5**	Use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation of up to three decimal places
					5M6	Understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints	**6M6**	Convert between miles and kilometres
	3M7	Measure the perimeter of simple 2–D shapes	**4M7a**	Measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres	**5M7a**	Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres	**6M7a**	Recognise that shapes with the same areas can have different perimeters and vice versa

Strand	National curriculum reference			
	Year 3	Year 4	Year 5	Year 6
Measurement (Continued)		**4M7b** Find the area of rectilinear shapes by counting squares	**5M7b** Calculate and compare the area of rectangles (including squares), and including using standard units, square centimetres (cm^2) and square metres (m^2) and estimate the area of irregular shapes	**6M7b** Calculate the area of parallelograms and triangles
				6M7c Recognise when it is possible to use the formulae for the area of shapes
			5M8 Estimate volume [eg: using 1cm^3 blocks to build cuboids (including cubes)] and capacity [eg: using water]	**6M8a** Calculate, estimate and compare volume of cubes and cuboids using standard units, including centimetre cubed (cm^3) and cubic metres (m^3), and extending to other units [eg: mm^3 and km^3]
				6M8b Recognise when it is possible to use the formulae for the volume of shapes
	3M9a Add and subtract amounts of money to give change, using both £ and p in practical contexts	**4M9** Calculate different measures, including money in pounds and pence	**5M9a** Use all four operations to solve problems involving measure [money] using decimal notation, including scaling	**6M9** Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate

Strand	National curriculum reference			
	Year 3	Year 4	Year 5	Year 6
Measurement (Continued)	**3M9b** Add and subtract lengths (m/cm/mm)		**5M9b** Use all four operations to solve problems involving measure [eg: length] using decimal notation, including scaling	
	3M9c Add and subtract mass (kg/g)		**5M9c** Use all four operations to solve problems involving measure [eg: mass] using decimal notation, including scaling	
	3M9d Add and subtract volume / capacity (l/ml)		**5M9d** Use all four operations to solve problems involving measure [eg: volume] using decimal notation, including scaling	
Geometry – properties of shapes	**G1 Within key stage 1 content domain**			
	3G2 Identify horizontal, vertical lines and pairs of perpendicular and parallel lines	**4G2a** Compare and classify geometric shapes, including quadrilaterals and triangles based on their properties and sizes	**5G2a** Use the properties of rectangles to deduce related facts and find missing lengths and angles	**6G2a** Compare and classify geometric shapes based on their properties and sizes
		4G2b Identify lines of symmetry in 2–D shapes presented in different orientations	**5G2b** Distinguish between regular and irregular polygons based on reasoning about equal sides and angles	**6G2b** Describe simple 3–D shapes
		4G2c Complete a simple symmetric figure with respect to a specific line of symmetry		

Strand	National curriculum reference			
	Year 3	Year 4	Year 5	Year 6
Geometry - properties of shapes (Continued)	**3G3a** Draw 2–D shapes			**6G3a** Draw 2–D shapes using given dimensions and angles
	3G3b Make 3–D shapes using modelling materials; recognise 3–D shapes in different orientations and describe them		**5G3b** Identify 3–D shapes including cubes and other cuboids, from 2–D representations	**6G3b** Recognise and build simple 3D shapes, including making nets
	3G4a Recognise that angles are a property of shape or a description of a turn	**4G4** Identify acute and obtuse angles and compare and order angles up to two right angles by size	**5G4a** Know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles	**6G4a** Find unknown angles in any triangles, quadrilaterals and regular polygons
	3G4b Identify right angles, recognise that two right angles make a half-turn, three make three quarters of a turn and four a complete turn; identify whether angles are greater than or less than a right angle		**5G4b** Identify: • angles at a point and one whole turn (total 360°) • angles at a point on a straight line and $\frac{1}{2}$ a turn (total 180°) • other multiples of 90°	**6G4b** Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles
			5G4c Draw given angles and measure them in degrees (°)	
				6G5 Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius

Strand	National curriculum reference							
	Year 3		Year 4		Year 5		Year 6	
Geometry – position and direction	**P1 Within key stage 1 content domain**							
			4P2	Describe movements between positions as translations of a given unit to the left/right and up/down	**5P2**	Identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed	**6P2**	Draw and translate simple shapes on the co-ordinate plane, and reflect them in the axes
			4P3a	Describe positions on a 2–D grid as co-ordinates in the first quadrant			**6P3**	Describe positions on the full co-ordinate grid (all four quadrants)
			4P3b	Plot specified points and draw sides to complete a given polygon				
Statistics	**3S1**	Interpret and present data using bar charts, pictograms and tables	**4S1**	Interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs	**5S1**	Complete, read and interpret information in tables, including timetables	**6S1**	Interpret and construct pie charts and line graphs and use these to solve problems
	3S2	Solve one-step and two-step questions [eg: 'How many more?' and 'How many fewer?'] using information presented in scaled bar charts, pictograms and tables	**4S2**	Solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs	**5S2**	Solve comparison, sum and difference problems using information presented in a line graph		
							6S3	Calculate and interpret the mean as an average

4.3 Elements of the national curriculum that cannot be assessed in this format

The table below identifies areas that are difficult to fully assess in a paper-based format. Some of the points below may be partially assessed.

Table 4: Elements of the national curriculum that cannot be assessed in a paper-based format

National curriculum reference	Explanation
5M8 – estimate capacity (eg: using water)	Requires practical equipment to assess validly.
3G3b – make 3–D shapes using modelling materials	Requires practical equipment to assess validly.
3C1, **5C1**, **4C6**, **5C5c**, **5C6a**, **6C6** and **6F11** – mental arithmetic skills	Mental mathematics skills cannot be directly assessed in a paper-based test since only the child's responses can be marked. For questions where only the answer is recorded, it is not possible to know the method that the child used or how quickly he or she completed the question. Children who are fluent with number will be able to use their mental arithmetic skills to find efficient strategies for completing calculations under test conditions. Therefore, good mental arithmetic skills will enable children to recall and apply number knowledge rapidly and accurately.

5. Cognitive domain

The cognitive domain seeks to make the thinking skills and intellectual processes required for the key stage 2 mathematics test explicit. Each question will be rated against the four strands of the cognitive domain listed in the tables below.

The cognitive domain will be used during test development to ensure comparability of demand as well as difficulty for tests of successive years. The national curriculum (2014) aims of solving problems, fluency and reasoning are reflected within the cognitive domain.

The cognitive domain for the mathematics test is based on the CRAS[2] tool . The four dimensions of CRAS describe the degree of **C**omplexity of the exam question, the availability of **R**esources to answer the question, the degree of **A**bstractness that the question presents and the **S**trategy required to answer the question. The user can then assign a demand score for a given question in each of the four cognitive strands using the tool.

The cognitive domain for the mathematics test essentially separates **C**omplexity in the original CRAS scale into two strands: one which describes the cognitive demands associated with conceptual understanding of mathematical facts and procedures; and a second which describes the computational complexity of the processes embedded within the task. We have combined the original strands of **R**esources and **A**bstractness into 'spatial reasoning and data interpretation' to best describe the demands associated with processing the information available in questions assessing geometry and data handling. The final strand of response strategy in our tool is very similar to the original CRAS definition of **S**trategy and describes the cognitive effort associated with organising a response.

The cognitive domain used for the mathematics test also aligns with other tools that have been used to assess mathematics items cognitively (see for example Webb's Depth of Knowledge (DOK) scale and the work of Smith and Stein)[3,4].

The following tables show the four strands of the cognitive domain for the mathematics test. Each strand is categorised using a four-point rating scale. More detailed descriptions of each strand are also provided.

2 Hughes S., Pollit A., & Ahmed A. (1998) 'The development of a tool for gauging demands of GCSE and A-Level exam questions.' Paper presented at the BERA conference The Queens University Belfast

3 Webb L. N. (1997). 'Criteria for alignment of expectations and assessments in mathematics and science education'. Research Monograph No. 8. Council of Chief School Officers.

4 Smith, M.S. Stein, M.K. (1998) 'Selecting and creating mathematical tasks: from research to practice'. Mathematics teaching in middle school 3 pp344-350.

5.1 Depth of understanding

This strand is used to assess the demand associated with recalling facts and using procedures to solve problems.

Questions requiring less depth of understanding require simple procedural knowledge, such as the quick and accurate recall of a fact or the application of a single procedure to solve a problem.

At intermediate levels of demand, a question may require the interpretation of a problem, or application of facts and procedures. However, the component parts of these questions are simple and the links between the parts and processes are clear.

At a high level of demand, a greater depth of understanding is expected. Questions may require that facts and procedures will need to be used flexibly and creatively to find a solution to the problem.

Table 5: Depth of understanding

Strand	Rating scale			
	(low) 1	2	3	4 (high)
Depth of understanding	Recall of facts or application of procedures	Use facts and procedures to solve simple problems	Use facts and procedures to solve more complex problems	Understand and use facts and procedures creatively to solve complex or unfamiliar problems

5.2 Computational complexity

This strand is used to assess the computational demand of problems.

In questions with lower complexity, it is likely that a one-step process such as a recalled fact or the application of a procedure will be sufficient to solve the problem.

At an intermediate level of complexity, more than one numeric step or computation will be needed to solve the problem.

At a high level of complexity, questions will have multiple numeric steps or computations and the links between them within the problem will be complex.

Table 6: Computational complexity

Strand	Rating scale			
	(low) 1	2	3	4 (high)
Computational complexity	No numeric steps	One, or a small number of numeric steps	A larger number of numeric steps. All steps are simple	A larger number of numeric steps, at least one of which is more complex

5.3 Spatial reasoning and data interpretation

This strand is used to assess the demand associated with the representation of geometrical problems involving 2-dimensional and 3-dimensional shapes and position and movement. This strand is also used to assess the demand associated with interpreting data presented in tables, pictograms, charts and graphs.

There is a low level of demand when all of the resources or information required to answer the question are presented within the problem, (eg: finding the perimeter of a shape by adding the length of the sides).

At intermediate levels of demand, spatial reasoning will be needed to manipulate the information presented in the question to solve the problem (eg: reflect a polygon in a mirror line). Children may need to select the appropriate information in order to complete the problem (eg: select the appropriate information from a table, chart or graph).

At the highest level of demand there may be the need to use complex spatial reasoning to interpret, infer or generate new information from that given before the problem can be completed (such as identifying 3-dimensional characteristics from 2-dimensional representations or making inferences from the given information).

Table 7: Spatial reasoning and data interpretation

Strand	Rating scale			
	(low) 1	2	3	4 (high)
Spatial reasoning	No spatial reasoning required	Manipulation of the geometric information is required	Complex manipulation of the geometric information is required	Interpret, infer or generate new geometric information
Data interpretation	No data interpretation required	Select and retrieve information	Select and interpret information	Generate or infer new information from data

5.4 Response strategy

This strand describes the demand associated with constructing a response to a question.

At a low level of demand, the strategy for answering a problem is given as part of the presentation of the problem.

At a lower intermediate level of demand, the strategy for answering a problem is clear and following simple steps will lead to completion of the problem. Some reasoned construction may be associated with organising appropriate working.

At an upper intermediate level of demand there may be the need to construct a straightforward response. Some reasoned construction may be associated with organising more complex working.

At a high level of demand, the question will require that a strategy is developed and monitored to complete the task. The answer may need to be constructed, organised and reasoned.

Table 8: Response strategy

Strand	Rating scale			
	(low) 1	2	3	4 (high)
Response strategy	Select one or more responses or construct a simple response	Construct a small set of responses	Construct a straightforward explanation. Shows evidence of a method	Construct a complex explanation

6. Test specification

This section provides details of each test component and paper.

6.1 Summary of test

The test will comprise two components, which will be presented to children as three separate papers.

Table 9: Format of the test

Component	Description	Number of papers	Number of marks	Timing of component
Paper 1	Arithmetic	1	30	30 minutes
Paper 2 and Paper 3	Mathematical fluency, solving problems and reasoning	2	80 overall 40 per paper	80 minutes 40 minutes per paper
	Total	**3**	**110**	**110 minutes**

6.2 Breadth and emphasis

The content and cognitive domains for the mathematics tests are specified in sections 4 and 5. The test will sample from the content domain in any given year. Although each element may not be included within each test, the full range of content detailed in this document will be assessed over time. Consolidation of the key stage 1 material is assumed within the key stage 2 programme of study and therefore material from key stage 1 may appear within the key stage 2 test. The questions in each test will be placed in order of difficulty as far as possible.

The following sections show the proportion of marks attributed to each of the areas of the content and cognitive domains in a test.

6.2.1 Profile of content domain

Each of the nine strands listed in table 10 will be tested on a yearly basis and these will be present in the tests in the ratios shown.

Table 10 shows the distribution of marks across the content domain.

Table 11 shows the distribution of marks across the components of the test and by national curriculum element.

Table 10: Profile of content domain

Content area Strand	Number of marks	Percentage of marks
Number, ratio and proportion, and algebra Number, place value, approximation and estimation (N) Addition, subtraction, multiplication, division, calculations (C) Fractions, decimals and percentages (F) Ratio and proportion (R) Algebra (A)	72–83	65–75%
Measurement, geometry and statistics Measurement (M) Geometry - properties of shapes (G) Geometry -position and direction (P) Statistics (S)	28–39	25–35%

Table 11: Profile of marks by paper and national curriculum element

Paper	Number	Measurement, geometry and statistics	Total marks
Paper 1 (Arithmetic)	30	0	30
Papers 2 and 3 (Fluency, problem solving and reasoning)	20–30	10–20	80 (40 each)

6.2.2 Profile of cognitive domain

The cognitive domain is specified in section 5. Each test question will be rated in terms of demand against each of the four strands of the cognitive domain. The allocation of marks across each strand and demand rating is detailed in table 12.

Table 12: Distribution of marks by cognitive domain strand

Cognitive domain strand	(low) 1	2–3	4 (high)	Total marks
Depth of understanding	20–60	30–70	10–30	**110**
Computational complexity	20–60	30–70	10–30	**110**
Spatial reasoning and data interpretation	60–80	20–40	0–20	**110**
Response strategy	40–60	40–60	0–20	**110**

6.3 Format of questions and responses

6.3.1 Paper 1

Paper 1 (arithmetic) will be comprised of constructed response questions, presented as context-free calculations. The majority of the arithmetic calculations will be worth one mark, however, two marks will be available for long multiplication and long division.

6.3.2 Papers 2 and 3

In Papers 2 and 3, mathematical problems are presented in a wide range of formats to ensure children can fully demonstrate mathematical fluency, solving problems and reasoning.

Papers 2 and 3 will include both selected response and constructed response questions.

Selected response questions, where children are required to select which option satisfies the constraint given in the question, will include question formats such as:

- multiple choice, where children are required to select their response from the options given
- matching, where children are expected to indicate which options match correctly
- true–false, where children are required to indicate whether each of a set of statements are true or false.

Constructed response questions, where children are required to construct an answer rather than simply select one or more options, will include the following.

- Constrained questions, where children are required to provide a single or best answer. These might involve giving the answer to a calculation, completing a chart or table, or drawing a shape. For questions worth more than one mark, partial credit will be available.
- Less constrained questions, where children are required to communicate their approach to evaluating a statement or problem.

Questions in Papers 2 and 3 comprise both those presented in context and out of context. Up to 50 per cent of marks across these papers will be set in context.

6.4 Marking and mark schemes

The tests will be externally marked on-screen by trained markers.

The mark scheme will give the general principles for marking the test to ensure consistency of marking together with specific guidance for the marking of each question.

The mark scheme will provide the total number of marks available for each question and the criteria by which markers should award the marks to children's responses. Where multiple correct answers are possible, examples of different types of correct answers will be given in the mark schemes. Where applicable, additional guidance will indicate minimally acceptable responses and unacceptable responses. The mark scheme will provide a content domain reference, so it is possible to determine what is assessed in each question.

For all questions, the mark schemes will be developed during the test development process and will combine the expectations of experts with examples of children's responses that have been obtained during trialling.

For multi-mark questions, where the correct answer has not been obtained, the mark scheme will indicate where marks are awarded for either using a formal method (Paper 1) or for correctly following a process or processes through the problem (Papers 2 and 3).

6.5 Reporting

The raw score on the test (the total achieved marks out of the total 110 marks) will be converted into a scaled score. Translating raw scores into scaled scores ensures performance can be reported on a consistent scale for all children. Scaled scores retain the same meaning from one year to the next. Therefore, a particular scaled score reflects the same level of attainment in one year as in the previous year, having been adjusted for any differences in difficulty of the test.

Additionally, each child will receive an overall result indicating whether or not he or she has achieved the required standard on the test. A standard-setting exercise will be conducted on the first live test in 2016 in order to determine the scaled score needed for a child to be considered to have met the standard. This process will be facilitated by the performance descriptor in section 6.7 which defines the performance level required to meet the standard. In subsequent years, the standard will be maintained using appropriate statistical methods to translate raw scores on a new test into scaled scores with an additional judgemental exercise at the expected standard. The scaled score required to achieve the expected level on the test will always remain the same.

The exact scale for the scaled scores will be determined following further analysis of trialling data. This will include a full review of the reporting of confidence intervals for scaled scores.

6.6 Desired psychometric properties

While the focus of the outcome of the test will be whether a child has achieved the expected standard, the test must measure children's ability across the spectrum of attainment. As a result, the test must aim to minimise the standard error of measurement at every point on the reporting scale, particularly around the expected standard threshold.

The provision of a scaled score will aid in the interpretation of children's performance over time as the scaled score which represents the expected standard will be the same year on year. However, at the extremes of the scaled score distribution, as is standard practice, the scores will be truncated such that above and below a certain point, all children will be awarded the same scaled score in order to minimise the effect for children at the ends of the distribution where the test is not measuring optimally.

6.7 Performance descriptor

This performance descriptor describes the typical characteristics of children whose performance in the key stage 2 tests is at the threshold of the expected standard. Children who achieve the expected standard in the tests have demonstrated sufficient knowledge to be well placed to succeed in the next phase of their education having studied the full key stage 2 programme of study in mathematics. This performance descriptor will be used by a panel of teachers to set the standards on the new tests following their first administration in May 2016. It is not intended to be used to support teacher assessment since it only reflects the elements of the programme of study that can be assessed in a written test (see the content domain in section 4).

6.7.1 Overview

Children working at the expected standard will be able to engage with all questions within the test. However, they will not always achieve full marks on each question, particularly if working at the threshold of the expected standard.

Questions will range from those requiring recall of facts or application of learned procedures to those requiring understanding of how to use facts and procedures creatively to decide how to solve complex and unfamiliar problems. There will be a variety of question formats including selected response, short answer and more complex calculations and explanations where the demonstration of an appropriate method may be rewarded.

Question difficulty will be affected by the strands of the cognitive domain such as computational complexity and spatial reasoning and data interpretation. This should be borne in mind when considering the remainder of this performance descriptor, since children working at the threshold of the expected standard may not give totally accurate or correct responses to questions. In cases where there are multiple interrelated computational steps and / or a need to infer new information or to visualise or represent an abstract problem, some children may find the question difficult to understand especially in a test setting. This will be true even when the performance descriptor determines that a skill should be within the child's capacity if working at the expected standard.

The following sections describe the typical characteristics of children in Year 6 working at the threshold of the expected standard. It is recognised that different children will exhibit different strengths, so this is intended as a general guide rather than a prescriptive list. References in square brackets [ ] refer to aspects of the content domain as specified in section 4.

6.7.2 Number

Children working at the expected standard are able to:

- use place value in whole numbers up to 1 000 000 to compare and order numbers and are beginning to become confident with numbers up to 10 000 000 [N2, N3]
- round any whole number to the nearest power of ten [N4]
- use negative numbers in practical contexts such as temperature and calculate intervals across zero [N5]

- count forwards or backwards in steps of any whole number with one significant figure, eg: 9, 20, 3000 [N1] to generate, describe and complete linear number sequences [A3]
- recognise and use multiples, factors, prime numbers less than 20 and square numbers up to 121 [C5]show evidence of using mental methods, including jottings where necessary to speed up the process, to add and subtract whole numbers with up to two significant figures (eg: 95 + 36, 5700 – 2900) [C1]
- add and subtract whole numbers with more than four digits, using formal written methods where appropriate [C2]
- use their understanding of place value to multiply and divide whole numbers and decimals with up to two decimal places by 10 or 100 (eg: 1532 ÷ 100 = , $\square$ ÷ 100 = 6.3) [C6]
- multiply and divide whole numbers mentally drawing upon multiplication facts up to 12 × 12 and place value (eg: 60 × 70) and begin to use these facts to work with larger numbers [C6]
- multiply numbers with up to two digits by a two digit number using a formal written method and becoming more confident with multiplication with larger numbers; multiply and divide numbers with up to four digits by a single digit number using the formal written method and becoming more confident with two digit divisors [C7]
- recognise and use equivalent fractions (eg: $\frac{300}{900} = \frac{1}{3}$; $\frac{4}{5} = \frac{8}{10} = \frac{80}{100}$) [F2]
- recognise and use the equivalences between simple fractions, decimals and percentages (eg: 0.3 = $\frac{3}{10}$ = 30%) and becoming more confident with calculating decimal fraction equivalents [F6, F11]
- find simple fractions and percentages of whole numbers and quantities (eg: $\frac{2}{3}$ of 90; 20 × $\frac{1}{5}$; 30% of £60) [F1, F5, R2]
- add and subtract fractions with the same denominator, using mixed numbers where appropriate for the context (eg: $1\frac{1}{5} - \frac{2}{5} = \frac{6}{5} - \frac{2}{5} = \frac{4}{5}$) [F2]
- add and subtract fractions with the same denominator and multiples of the same number (eg: $\frac{1}{4} + \frac{5}{8} = \frac{7}{8}$) and becoming more confident with more complex fraction calculations [F4]
- add and subtract decimal numbers that have the same number of decimal places (eg: 157.31 – 29.16) [F10]
- multiply a one digit decimal number by a single digit number (eg: 0.6 × 8) [F9]
- use simple ratio to compare quantities (eg: Every child is given 3 pencils and a pen. 36 pencils were given out. How many pens were needed?) and estimate the distance from a map using a simple scale (eg: where 1 cm represents 100 m) [R1, R3]
- use simple formulae expressed in words (eg: time needed to cook a chicken: allow 20 minutes plus 40 minutes per kilogram) [A2]
- find possible values in missing number problems involving one or two unknowns (eg: Ben thinks of two numbers: the sum of the two numbers is 10: multiplied together they make 24: what are Ben's numbers?) [A1, A4].

6.7.3 Measurement

Children working at the expected standard are able to:

- read, write and convert time between analogue (including clock faces using Roman numerals) and digital 12 and 24 hour clocks, using am and pm where necessary [M4]
- calculate the duration of an event using appropriate units of time (eg: A film starts at 6:45pm and finishes at 8:05pm. How long did it last?) [M4]
- Children convert between 'adjacent' metric units of measure for length, capacity and mass (eg: 1.2 kg = 1200 g; how many 200 ml cups can be filled from a 2 litre bottle?; write 605 cm in metres) [M5]
- Find the perimeter of compound shapes when all side lengths are known or can be easily determined (eg: a simple shape made from two identical rectangles joined together to make an L-shape with given dimensions of the rectangle) [M7]
- estimate the area of irregular shapes by counting squares (including half squares and fractions of squares that join with others to make whole squares) [M7]
- calculate and compare the area of squares and rectangles including using standard units, square centimetres (cm^2) and square metres (m^2) and estimate the area of irregular shapes by counting squares [M7].

6.7.4 Geometry

Children working at the expected standard are able to:

- compare and classify 3–D and 2–D shapes based on their properties (eg: for 2–D shapes: parallel sides, length of sides, type and size of angles [G4], reflective symmetry [G2], regular / irregular polygons [G2]; for 3–D shapes: faces, vertices and edges) [G2]
- recognise, describe simple 3–D shapes, including using nets and other 2–D representations [G3]
- complete simple shapes using given lengths, such as 7.5cm, (accurate to +/ –2 mm) and acute angles that are multiples of 5° (accurate to +/- 2°) [G3]
- know and use the facts that angles at a point sum to 360°, angles at a point on a straight line sum to 180° and angles in a triangle sum to 180° (eg: calculate the base angles of an isosceles triangle where the other angle is 110°) and identify other multiples of 90° [G4]
- identify, describe and represent the position of a shape following a reflection or translation [P2]
- describe positions on a 2–D co-ordinate grid using axes with equal scales in the first quadrant (in the context of number or geometry) and use co-ordinates to complete a given rectangle; becoming more confident in all four quadrants [P3].

6.7.5 Statistics

Children working at the expected standard are able to:

- complete, read and interpret information presented in tables and bar charts (eg: find the difference between two bars showing temperatures, where one is 20°C and the other is 13°C, on a scale labelled in multiples of 5) [S1]
- interpret line graphs (eg: beginning to find the difference between two temperatures on a line graph, where one is 20°C and the other is 13°C, on a scale labelled in multiples of 5) and simple pie charts (eg: a pie chart cut into eight pieces for favourite fruit using whole numbers for each section) [S1]
- calculate the mean as an average for simple sets of discrete data (eg: find the mean mass of three parcels weighing 5kg, 3kg and 10kg) [S3].

6.7.6 Solving problems and reason mathematically

Children working at the expected standard are able to:

- develop their own strategies to solve problems by applying their mathematics to a variety of routine and non-routine problems, in a range of contexts (including money and measures, geometry and statistics) using the content described above
- begin to reason mathematically making simple generalisations, using mathematical language and searching for solutions by trying out ideas of their own
- use and interpret mathematical symbols and diagrams, and present information and results in a clear and organised way; for example:
  - derive strategies to solve problems with a two or three computational steps using addition, subtraction, multiplication and division and a combination of these (eg: extract and add prices from a table and calculate change, or solve problems such as 'Jason bought some bags of green apples (6 for 75p) and some bags of red apples (10 for 90p). He spent £4.20. How many bags of each type of apples did he buy?') [C4, C8]
  - solve problems involving numbers with up to two decimal places (eg: find the two numbers which sum to 10 from this list: 0.01, 0.11, 1.01, 9.09, 9.9, 9.99) [F10, M9]
  - select appropriate strategies when calculating depending on the numbers involved [N6]
  - use rounding and estimation to check their answers and determine, in the context of the problem, appropriate levels of accuracy [C3]
  - identify simple patterns and relationships, and make simple generalisations. They can draw their own conclusions and explain their reasoning in simple contexts using mathematical language (eg: an explanation to satisfy statements such as *'If you add a two-digit number to a two-digit number you cannot get a four-digit number'*
  - make simple connections between mathematical ideas
  - solve problems involving data [S2].

7. Diversity and inclusion

The Equality Act 2010 sets out the principles by which the national curriculum assessment and associated development activities are conducted. During the development of the tests, STA's test development division will make provision to overcome barriers to fair assessment for individuals and groups wherever possible.

National curriculum tests will also meet Ofqual's core regulatory criteria. One of the criteria refers to the need for assessment procedures to minimise bias: 'The assessment should minimise bias, differentiating only on the basis of each learner's ability to meet national curriculum requirements' (Ofqual, www.ofqual.gov.uk/files/2011-regulatory-framework-for-national-assessments.pdf).

The end of key stage 2 mathematics test should:

- use appropriate means to allow all children to demonstrate their mathematical fluency, solving problems and reasoning
- provide a suitable challenge for all children and give every child the opportunity to achieve as high a standard in mathematics as possible
- provide opportunities for all children to achieve, irrespective of gender, including children with special educational needs, children with disabilities, children from all social and cultural backgrounds and those from diverse linguistic backgrounds
- use materials that are familiar to children and for which they are adequately prepared
- not be detrimental to children's self-esteem or confidence
- be free from stereotyping and discrimination in any form.

The test development process uses the principles of universal design, as described in the Guidance on the principles of language accessibility in national curriculum assessments (Ofqual, 2012; www.ofqual.gov.uk/news/new-language-accessibility-guidance-published/).

In order to improve general accessibility for all children, where possible, questions will be placed in order of difficulty. Accordingly, to be consistent with all national curriculum tests, attempts have been made to make the question rubric as accessible as possible for all children, including those who experience reading and processing difficulties, and those for whom English is an additional language, while maintaining an appropriate level of demand to adequately assess the content. This includes applying the principles of plain English and universal design wherever possible, conducting interviews with children, and taking into account feedback from expert reviewers.

For each test in development, expert opinions on specific questions are gathered, for example, at inclusion panel meetings which are attended by experts and practitioners from across the fields of disabilities and special educational needs. This provides an opportunity for some questions to be amended or removed in response to concerns raised.

Issues likely to be encountered by children with specific learning difficulties have been considered in detail. Where possible, features of questions that lead to construct irrelevant variance (for example, question formats and presentational features) have been considered and questions have been presented in line with best practice for dyslexia and other specific learning difficulties.

7.1 Access arrangements

The full range of access arrangements applicable to key stage 2 assessments as set out in the ARA will be available to eligible children as required.

Appendix: Glossary of terminology used in the test framework

cognitive domain	Cognitive processes refer to the thinking skills and intellectual processes that occur in response to a stimulus. The cognitive domain makes explicit the thinking skills associated with an assessment. The cognitive domain, as shown in this framework, also identifies other factors that may influence the difficulty of the questions.
component	A section of a test, presented to children as a test paper or test booklet. Some tests may have two or more components which each child needs to sit in order to complete the test. The key stage 2 mathematics test comprises of two components.
content domain	The body of subject knowledge to be assessed by the test.
construct irrelevant variance	Construct irrelevant variance is the variation in children's test scores that does not come from their knowledge of the ideas being tested. It can result in children gaining fewer marks than their knowledge would suggest or lead to the award of more marks then their knowledge alone would deserve. The former can occur, for example, when questions in a mathematics test also unintentionally measure reading ability. The latter often occurs when unintended clues within questions allow children to answer correctly without having the required subject knowledge.
distribution	The range of possible scaled scores.
domain	The codified definition of a body of skills and knowledge.
mark scheme	The document explaining the creditworthy responses or the criteria that must be applied to award the mark for a question in the test.
national curriculum	For each subject and key stage, the national curriculum outlines the content and skills that should be taught in schools.
performance descriptor	Description of the typical characteristics of children working at a particular standard. For these tests, the performance descriptor will characterise the minimum performance required to be working at the appropriate standard for the end of the key stage.
programme of study	The statutory curriculum of subject knowledge, skills and understanding for a key stage. The key stage 1 and 2 programmes of study are published online at at: www.education.gov.uk/schools/teachingandlearning/curriculum.

raw score	The unmodified score achieved on a test, following marking. In the case of these tests it is the total marks achieved. For example, if a child scores 27 out of 60 possible marks, the raw score is 27. Raw scores are often then converted to other measures such as percentile ranks, standardised scores or grades.
scaled score	A score which has been translated from a raw score onto a score on a fixed, defined scale. This allows performance to be reported on a consistent scale for all children, which retains the same meaning from one year to the next. Therefore, a particular scaled score reflects the same level of attainment in one year as in the previous year, having adjusted for any differences in difficulty of the specific tests.
standard	The required level of attainment in order to be classified into a particular performance category.
standard error of measurement	A reliability estimate that allows the user to determine a confidence interval around a test score. It is a measure of the distribution of scores that would be attained by a child had that child taken the test repeatedly under the same conditions.
standard setting	The process of applying the standard onto a particular test in order to determine the score required for a child to be classified within a particular performance category.
test framework	A document that sets out the principles, rationale and key information about the test and contains a test specification.
test specification	A detailed specification of what is to be included in a test in any single cycle of development.
truncate	To shorten by removing the ends.

Standards & Testing Agency

About this publication

Who is it for?

This document is primarily aimed at those responsible for developing the key stage 2 national curriculum test in mathematics It may also be of interest to schools with children in key stage 2 and other education professionals.

What does it cover?

Detailed information to ensure an appropriate test is developed, including the:

- content domain
- cognitive domain
- test specification

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