National curriculum tests

Key stage 1

Mathematics test framework

National curriculum tests from 2016

For test developers

Standards & Testing Agency

Key stage 1 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 the summer term 2016. The framework specifies the purpose, format, content and cognitive domain of the key stage 1 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.

1.1 Purposes of statutory assessment

The main purpose of statutory assessment is to ascertain what pupils 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 and the Government's consultation document on primary assessment and accountability are to:

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

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.

Some elements of the statutory 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 associated with the measurement of mathematics are also detailed in the cognitive domain.

The test framework also includes 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, marking and 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 that the key stage 1 tests will be internally marked by teachers, an additional study to consider the reliability of marking will be undertaken as part of the 'technical pre-test' trial in the first year. 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 1 mathematics test forms part of the statutory assessment arrangements for pupils at the end of key stage 1.

The test is based on the national curriculum statutory programme of study (2014) for mathematics at key stage 1. The mathematics test will cover the aspects of the curriculum that lend themselves to paper-based testing.

The key stage 1 mathematics test will be marked by teachers.

3.1 Population to be assessed

All eligible pupils who are registered at maintained schools, special schools or academies (including free schools) in England and are at the end of key stage 1 will be required to take the key stage 1 mathematics test, unless they have taken it in the past.

Some pupils are exempt from the tests. Further details are in the ARA, which can be found on the GOV.UK website at www.gov.uk/sta.

3.2 Test format

The mathematics test comprises two components, which are presented to pupils as two separate test papers. The first paper is an arithmetic paper. The second paper presents a range of mathematical reasoning and problem-solving questions. The test is administered on paper.

The tests are designed to enable pupils to demonstrate their attainment and as a result are not strictly timed, since the ability to work at pace is not part of the assessment. However, elements within the curriculum state that pupils should be able to use quick recall of mathematical facts and the arithmetic paper is designed to assess some of these elements. Guidance will be provided to schools to ensure that pupils are given sufficient time to demonstrate what they understand, know and can do without prolonging the test inappropriately. Table 1 opposite provides an indication of suggested timings for each component. The total testing time is approximately 55 minutes. If teachers or administrators change the time significantly, the test outcomes will be less reliable.

Table 1: Format of the test

Component	Description	Number of papers	Number of marks	Approximate timing of paper
Paper 1: arithmetic	assesses pupils' confidence and mathematical fluency with whole numbers, place-value and counting	1	25	20 minutes
Paper 2: mathematical reasoning	mathematical fluency, solving mathematical problems and mathematical reasoning	1	35	35 minutes
	Total	**2**	**60**	**Recommended 55 minutes**

3.3 Resource list

The resource list for the test is:

- **Paper 1: arithmetic –** a pencil; ruler; rubber (optional)
- **Paper 2: mathematical reasoning –** a pencil; a sharp, dark pencil for mathematical drawing; ruler (showing centimetres and millimetres); mirror; rubber (optional).

Pupils will not be permitted to use a calculator, tracing paper, number apparatus or other supporting equipment in either of the components.

4. Content domain

The content domain sets out the relevant elements from the national curriculum programme of study (2014) for mathematics at key stage 1 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 1 tests (section 4.3). Attainment in these elements will be monitored through teacher assessment.

Tables 2 and 3 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.

The numbering in Table 2 is not sequential because content that relates to key stage 2 has been removed from it.

4.1 Content domain referencing system

A referencing system is used in the content domain to indicate the year, the strand and the substrand, for example '1N1' equates to:

- year – 1
- strand – Number and place value
- substrand – 1

Table 2 shows the references for the strands and substrand, and Table 3 shows the progression across the years.

Table 2: Content domain strands and substrands

Strand	Substrand	Content domain reference
Number and place value	counting (in multiples)	**N1**
	read, write, order and compare numbers	**N2**
	identify, represent and rounding	**N4**
	number problems	**N6**

Strand	Substrand	Content domain reference
Addition, subtraction, multiplication and division (calculations)	add / subtract mentally	**C1**
	add / subtract using written methods	**C2**
	use inverses and check	**C3**
	add / subtract to solve problems	**C4**
	multiply / divide mentally	**C6**
	multiply / divide using written methods	**C7**
	solve problems based on all four operations and knowledge of the commutative facts	**C8**
	order of operations	**C9**
Fractions	recognise, find, write, name and count fractions	**F1**
	equivalent fractions	**F2**
Measurement	compare, describe and order measures	**M1**
	measure and read scales	**M2**
	money	**M3**
	telling time, ordering time and units of time	**M4**
	solve mathematical problems involving measures	**M9**
Geometry – properties of shape	recognise and name common shapes	**G1**
	describe properties and classify shapes	**G2**
	draw and make shapes and relate 2-D to 3-D shapes	**G3**
Geometry – position and direction	patterns	**P1**
	describe position, direction and movement	**P2**
Statistics	interpret and represent data	**S1**
	solve problems involving data	**S2**

4.2 Content domain for key stage 1 mathematics

Table 3: Content domain

Strand	Content domain reference Year 1		Content domain reference Year 2	
Number and place value	**1N1a**	count to and across 100, forward and backwards, beginning with 0 or 1, or from any given number	**2N1**	count in steps of 2, 3 and 5, from 0, and in tens from any number, forward or backward
	1N1b	count in multiples of twos, fives and tens		
	1N2a	count, read and write numbers to 100 in numerals	**2N2a**	read and write numbers to at least 100 in numerals and in words
	1N2b	given a number, identify one more and one less	**2N2b**	compare and order numbers from 0 up to 100; use $<$, $>$ and $=$ signs
	1N2c	read and write numbers from 1 to 20 in numerals and words		
			2N3	recognise the place value of each digit in a two-digit number (tens and ones)
	1N4	identify and represent numbers using objects and pictorial representations including the number line, and use the language of: equal to, more than, less than (fewer), most and least	**2N4**	identify, represent and estimate numbers using different representations, including the number line
			2N6	use place value and number facts to solve problems

Strand	Content domain reference Year 1		Content domain reference Year 2	
Addition, subtraction, multiplication and division (calculations)	**1C1**	represent and use number bonds and related subtraction facts within 20	**2C1**	recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100
	1C2a	add and subtract one-digit and two-digit numbers to 20, including zero	**2C2a**	add and subtract numbers mentally, including: • a two-digit number and ones • a two-digit number and tens • two two-digit numbers • adding three one-digit numbers
			2C2b	add and subtract numbers using concrete objects and pictorial representations, including: • a two-digit number and ones • a two-digit number and tens • two two-digit numbers • adding three one-digit numbers
	1C2b	read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs		
			2C3	recognise and use the inverse relationship between addition and subtraction and use this to check calculations and missing number problems
	1C4	solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as $7 = \square - 9$	**2C4**	solve problems with addition and subtraction: • using concrete objects and pictorial representations, including those involving numbers, quantities and measures • applying their increasing knowledge of mental and written methods

Strand	Content domain reference Year 1	Content domain reference Year 2
Addition, subtraction, multiplication and division (calculations) (continued)		**2C6** recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers
		2C7 calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs
	1C8 solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher	**2C8** solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts
		2C9a show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot
		2C9b show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot
Fractions	**1F1a** recognise, find and name a half as one of two equal parts of an object, shape or quantity	**2F1a** recognise, find, name and write fractions $\frac{1}{3}$, $\frac{1}{4}$, $\frac{2}{4}$ and $\frac{3}{4}$ of a length, shape, set of objects or quantity
	1F1b recognise, find and name a quarter as one of four equal parts of an object, shape or quantity	**2F1b** write simple fractions [e.g. $\frac{1}{2}$ of 6 = 3]
		2F2 recognise the equivalence of $\frac{2}{4}$ and $\frac{1}{2}$

Strand	Content domain reference Year 1		Content domain reference Year 2	
Measurement	**1M1**	compare, describe and solve practical problems for: • lengths and heights [e.g. long / short, longer / shorter, tall / short, double / half] • mass / weight [e.g. heavy / light, heavier than, lighter than] • capacity and volume [e.g. full / empty, more than, less than, half, half full, quarter] • time [e.g. quicker, slower, earlier, later]	**2M1**	compare and order lengths, mass, volume / capacity and record the results using >, < and =
	1M2	measure and begin to record the following: • lengths and heights • mass / weight • capacity and volume • time (hours, minutes, seconds)	**2M2**	choose and use appropriate standard units to estimate and measure length / height in any direction (m / cm); mass (kg / g); temperature (°C); capacity (litres / ml) to the nearest appropriate unit using rulers, scales, thermometers and measuring vessels
	1M3	recognise and know the value of different denominations of coins and notes	**2M3a**	recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value
			2M3b	find different combinations of coins that equal the same amounts of money
	1M4a	tell the time to the hour and half past the hour and draw the hands on a clock face to show these times	**2M4a**	tell and write the time to five minutes, including quarter past / to the hour and draw the hands on a clock face to show these times
	1M4b	sequence events in chronological order using language [e.g. before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening]	**2M4b**	compare and sequence intervals of time
	1M4c	recognise and use language relating to dates, including days of the week, weeks, months and years	**2M4c**	know the number of minutes in an hour and the number of hours in a day
			2M9	solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change

Strand	Content domain reference Year 1		Content domain reference Year 2	
Geometry – properties of shapes	**1G1a**	recognise and name common 2-D shapes [e.g. rectangles (including squares), circles and triangles]	**2G1a**	compare and sort common 2-D shapes and everyday objects
	1G1b	recognise and name common 3-D shapes [e.g. cuboids (including cubes), pyramids and spheres]	**2G1b**	compare and sort common 3-D shapes and everyday objects
			2G2a	identify and describe the properties of 2-D shapes, including the number of sides and line symmetry in a vertical line
			2G2b	identify and describe the properties of 3-D shapes including the number of edges, vertices and faces
			2G3	identify 2-D shapes on the surface of 3-D shapes, [e.g. a circle on a cylinder and a triangle on a pyramid]
Geometry – position and direction			**2P1**	order and arrange combinations of mathematical objects in patterns and sequences
	1P2	describe position, directions and movement, including half, quarter and three-quarter turns	**2P2**	use mathematical vocabulary to describe position, direction and movement, including movement in a straight line and distinguishing between rotation as a turn and in terms of right angles for quarter, half and three-quarter turns (clockwise and anti-clockwise)
Statistics			**2S1**	interpret and construct simple pictograms, tally charts, block diagrams and simple tables
			2S2a	ask and answer simple questions by counting the number of objects in each category and sorting the categories by quantity
			2S2b	ask and answer questions about totalling and comparing categorical data

4.3 Elements of the national curriculum that cannot be assessed fully

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 curriculum that cannot be assessed fully

Content domain reference	Explanation
1C8 – with the support of the teacher	The 'with the support of the teacher' element applies only to classroom assessment.
2C1 – recall and use addition and subtraction facts to 20 fluently **2C2a** – add and subtract numbers mentally **2C4** – solve problems with addition and subtraction: applying their increasing knowledge of mental methods **2C8** – solve problems involving multiplication and division, using mental methods	Mental mathematics skills cannot be directly assessed in a paper-based test since you can only mark what the pupil records. For questions where only the answer is recorded, it is not possible to know the method that the pupil used or how quickly he or she completed the question. Pupils who are fluent with numbers 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 pupils to recall and apply number knowledge rapidly and accurately.
2C2b – using concrete objects	The 'using concrete objects' element applies only to classroom assessment.
2S2a and **2S2b** – asking questions	The 'ask questions' element is more suited to classroom assessment.

5. Cognitive domain

The cognitive domain seeks to make the thinking skills and intellectual processes required for the key stage 1 mathematics test explicit. Each question will be rated against the four strands of the cognitive domain listed in sections 5.1 to 5.4 below to provide an indication of the cognitive demand.

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

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 mathematical facts 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 the application of facts or 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	application of learned facts and procedures	use facts to solve simple problems	understand and use facts and procedures to solve more complex problems

5.2 Computational complexity

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

In questions with low complexity, there will be no numeric operation.

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 involve more than two processes or numeric operations.

Table 6: Computational complexity

Strand	Rating scale			
	(low) 1	2	3	4 (high)
Computational complexity	no numeric steps	one numeric step	more than one numeric step - all steps are simple	more than one numeric step, 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, position and movement. This strand is also used to assess the demand associated with interpreting data.

There is a low level of demand when all the resources or information required to answer the question are presented within the problem (e.g. counting the number of sides of a given 2-D shape).

At intermediate levels of demand, spatial reasoning will be needed to manipulate the information presented in the question to solve the problem (e.g. find a line of symmetry on a simple shape or interpret a 2-D representation of a 3-D shape). Pupils may need to select the appropriate information in order to complete the problem (e.g. from a table, chart or graph).

At the highest level of demand, there may be the need to use complex manipulation or interpretation of the information as part of the problem.

Table 7: Spatial reasoning and data interpretation

Strand	Rating scale			
	(low) 1	2	3	4 (high)
Spatial reasoning	no spatial reasoning required	all and only the geometric information required to solve the problem is present	manipulation of the geometric information given is required to solve the problem	complex manipulation of the geometric information given is required to solve the problem
Data interpretation	no data information required	select and retrieve information	select and interpret information	interpret more complex information, or interpret more than one piece of 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 solving a problem is given as part of the presentation of the problem.

At a lower intermediate level of demand, the strategy for solving a problem is clear. Very little construction is required to complete the task.

At an upper intermediate level of demand, there may be simple procedures to follow that will lead to completion of the problem.

At a high level of demand, the question will require that a simple strategy is developed (and perhaps 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 response	select multiple responses or single constructed response required	construct a small set of simple responses	constructs a complex response and / or shows evidence of a method

6. Test specification

This section provides details of each test component.

6.1 Summary

The test comprises two components, which will be presented to pupils as two separate papers.

Table 9: Format of the test

Component	Description	Number of papers	Number of marks	Approximate timing of paper
Paper 1: arithmetic	assesses pupils' confidence and mathematical fluency with whole numbers, place-value and counting	1	25	20 minutes
Paper 2 : mathematical reasoning	mathematical fluency, solving mathematical problems and mathematical reasoning	1	35	35 minutes
	Total	**2**	**60**	**Recommended 55 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 every element may not be included within each test, the full range of assessable content detailed in this document will be assessed over time. The questions in each test will be placed in an approximate order of difficulty.

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 seven strands listed in Table 10 will be tested on a yearly basis and these will be present in the tests in the proportions 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	Number of marks	Percentage of marks
Number Number and place value (N) Addition, subtraction, multiplication, division (calculations) (C) Fractions (F)	48–54	80–90%
Measurement, geometry and statistics Measurement (M) Geometry – properties of shapes (G) Geometry – position and direction (P) Statistics (S)	6–12	10–20%

Table 11: Profile of marks by paper and curriculum element

Component	Number	Measurement, geometry and statistics	Total marks
Paper 1: arithmetic	25	0	**25**
Paper 2: mathematical reasoning	23–29	6–12	**35**
			60

6.2.2 Profile of cognitive domain

The cognitive domain is specified in section 5. The allocation of marks across each strand and demand rating is detailed in Table 12.

Table 12: Profile of marks by cognitive domain strand

Cognitive domain strand	(low) 1	2–3	4 (high)	Total marks
Depth of understanding	0–20	30–60	0–10	**60**
Computational complexity	10–20	30–50	0–10	**60**
Spatial reasoning and data interpretation	45–55	0–15	0–5	**60**
Response strategy	0–10	40–60	0–10	**60**

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 arithmetic questions will each be worth one mark.

6.3.2 Paper 2

For Paper 2, mathematical reasoning problems are presented in a wide range of formats to ensure pupils can fully demonstrate mathematical fluency, mathematical problem solving and mathematical reasoning. There will be six aural questions at the start: one practice question and five test questions. These questions will help the pupils settle into the test; they will be placed in approximate order of difficulty. All questions may be read aloud, so that reading ability does not impair a pupil's ability to demonstrate his or her mathematical attainment.

Paper 2 will include both selected response and constructed response questions.

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

- multiple choice, where pupils are required to select their response from the options given
- matching, where pupils are expected to indicate which options match correctly
- true / false or yes / no questions, where pupils are expected to choose one response for each statement.

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

- constrained questions, where pupils 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 pupils are required to communicate their approach to solving a problem.

Questions in Paper 2 will comprise items presented in context and out of context.

6.4 Marking and mark schemes

The key stage 1 tests will be marked internally by teachers.

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

The mark schemes will provide the total number of marks available for each question and the criteria by which teachers should award the marks to pupils' responses. Where multiple correct answers are possible, examples of different types of correct answer will be given in the mark schemes. Where applicable, additional guidance will indicate minimally acceptable and unacceptable responses. The mark schemes 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 pupils' responses obtained during trialling.

For two-mark questions, where the correct answer has not been obtained, the mark scheme will indicate how marks can be awarded for correctly following a process or processes through the problem.

Within the mark schemes, examples of responses will be developed for 'method' questions. This is because the questions are open, leading to pupils giving a wide range of responses that are very close to the border between creditworthy or non-creditworthy. The additional examples help to improve marking reliability by providing examples of responses that fall just either side of the border of what is creditworthy or non-creditworthy.

There will be a system of sampling and moderation of marking organised by STA to ensure consistency between schools. Full details will be available in the ARA.

6.5 Reporting

The raw score on the test (the total marks achieved out of the 60 marks available) will be converted into a scaled score using a conversion table. Translating raw scores into scaled scores ensures performance can be reported on a consistent scale for all pupils. Scaled scores retain the same meaning from one year to the next. Therefore, a particular scaled score reflects the same standard of attainment in one year as in the previous year, having been adjusted for any differences in difficulty of the test.

Additionally, each pupil 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 to determine the scaled score needed for a pupil 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 standard on the test will remain the same.

6.6 Desired psychometric properties

While the focus of the outcome of the test will be whether a pupil has achieved the expected standard, the test must measure pupils' 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 pupils' performance over time, as the scaled score that 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 or below a certain point all pupils will be awarded the same scaled score to minimise the effect for pupils 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 pupils whose performance in the key stage 1 test is at the threshold of the expected standard. Pupils 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 1 programme of study in mathematics. This performance descriptor will be used by panels 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 reflects only the elements of the programme of study that can be assessed in a written test (see content domain in section 4).

6.7.1 Overview

Pupils 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 more complex and unfamiliar problems. There will be a variety of question formats including selected response, short answer and more complex calculations involving a small number of steps.

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 pupils working at the threshold of the expected standard may not give correct responses to all questions. In cases where there are multiple interrelated computational steps and/or a need to infer new information or to visualise or represent a more abstract problem, some pupils may find the question difficult to understand in a test setting. This will be true even when the performance descriptor determines that a skill should be within the pupil's capacity if working at the expected standard.

The following sections describe the typical characteristics of pupils in Year 2 working at the threshold of the expected standard. It is recognised that different pupils 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 specified in section 4.

6.7.2 Number

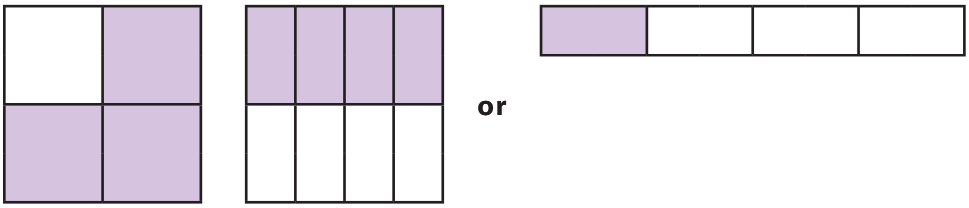
Pupils working at the expected standard are able to:

- count in multiples of 2, 5 and 10, to 100, forwards and backwards [N1]
- count forwards in multiples of 3 to 30 [N1]

- count in steps of 10, to 100, forward and backward (e.g. 97, 87, 77, 67, …) [N1]
- read and write numbers to at least 100 in numerals, and make recognisable attempts to write numbers to 100 in words [N2]
- use place value in whole numbers up to 100 to compare and order numbers, using less than (<), equals (=) and greater than (>) signs correctly [N2]
- identify, represent and estimate numbers within a structured environment (e.g. estimate 33 on a number line labelled in multiples of ten) [N4]
    - 

- use place value and number facts to solve problems (e.g. $60 - \square = 20$) [N6]
- use addition and subtraction facts [C1]
- add and subtract numbers using pictorial representations, including:
    - a two-digit number and ones (e.g. $65 + 8$, $79 - 6$)
    - a two-digit number and tens (e.g. $62 + 30$, $74 - 20$)
    - two two-digit numbers (e.g. $36 + 41$, $56 - 22$)
    - three one-digit numbers (e.g. $9 + 6 + 8$) [C2]
- use inverse operations to solve missing number problems for addition and subtraction (e.g. given $9 + 5 = 14$, complete $14 - \square = 9$ and $\square - 9 = \square$) [C3]
- solve simple 2-step problems with addition and subtraction (e.g. Ben has 5 red marbles and 6 blue marbles. He gives 7 of his marbles to a friend. How many marbles does he have left?) [C4]
- recall and use multiplication and division facts for the 10 multiplication table using the appropriate signs (×, ÷ and =) (e.g. $80 \div 10 = \square$) [C6, C7]
- recall and use multiplication facts for the 2 and 5 multiplication tables and begin to recall and use division facts for the 2 and 5 multiplication tables using appropriate signs (×, ÷ and =) (e.g. $2 \times \square = 16$, $5 \times 6 = \square$) [C6, C7]
- recognise odd and even numbers [C6]
- solve problems involving multiplication and division (e.g. Ben shares 15 grapes between 3 friends; how many grapes do they each receive?) [C8]
- know that addition and multiplication of two small numbers can be done in any order (commutative) and subtraction of one number from another cannot (e.g. $5 \times 6 = 6 \times 5$, but $19 - 12$ is not equal to $12 - 19$) [C9]
- recognise and find half of a set of objects or a quantity (e.g. find $\frac{1}{2}$ of 18 pencils) and begin to find $\frac{1}{3}$ or $\frac{1}{4}$ or $\frac{3}{4}$ of a small set of objects (e.g. find $\frac{1}{3}$ of nine pencils) [F1]

- recognise, find and name fractions $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{2}{4}$ and $\frac{3}{4}$ of a shape (e.g. shade $\frac{1}{4}$ or $\frac{3}{4}$ of a square split into 4 equal rectangles, or shade $\frac{1}{2}$ of a symmetrical shape split into 8 equal parts [F1]



- recognise the equivalence of two quarters and one half in practical contexts [F2].

6.7.3 Measurement

Pupils working at the expected standards are able to:

- compare and order lengths, mass, volume / capacity (e.g. 30 cm is longer than 20 cm [M1]
- choose and use appropriate standard units to measure length / height in any direction (m / cm); mass (kg / g); temperature (°C); capacity (litres / ml) to the nearest appropriate unit (e.g. the bucket contains 4 litres of water, scale marked every litre and labelled at 5 litres) using rulers, scales, thermometers and measuring vessels and begin to make good estimates (e.g. the book is about 20 cm long) [M2]
- recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value and find different combinations of coins to equal the same amounts of money (e.g. find two different ways to make 48p) [M3]
- recognise, tell and write the times: o'clock, half past and quarter past and quarter to the hour; draw hands on a clock face to show half past and o'clock times [M4]
- begin to tell and write the time to five minutes, including quarter past / to the hour and draw hands on a clock face to show these times [M4]
- solve problems in a practical context involving addition and subtraction of money of the same unit, including giving change (e.g. Mrs Smith buys a cake for 12p and a biscuit for 5p; how much change does she get from 20p?) [M9].

6.7.4 Geometry

Pupils working at the expected standards are able to:

- compare and sort common 2-D shapes (e.g. semi-circle, rectangle and regular polygons such as pentagon, hexagon and octagon) and everyday objects, identifying and describing their properties (e.g. the number of sides or vertices, and recognise symmetry in a vertical line) [G1, G2]
- compare and sort common 3-D shapes (e.g. cone, cylinder, triangular prism, pyramid) and everyday objects, identifying and describing their properties (e.g. flat / curved surfaces, and beginning to count number of faces and vertices correctly) [G1, G2]

- identify 2-D shapes on the surface of 3-D shapes and images of them (e.g. a circle on a cylinder and a triangle on a pyramid) [G3]
- order and arrange combinations of mathematical objects in patterns (e.g. continue a repeating pattern such as ●●★▲●●★▲●) [P1]
- use mathematical vocabulary to describe position, direction (e.g. left and right) and movement including movement in a straight line and distinguish between rotation as a turn, and in terms of right angles for quarter and half turns [P2].

6.7.5 Statistics

Pupils working at the expected standards are able to:

- interpret simple pictograms (where the symbols show one-to-one correspondence), tally charts, block diagrams (where the scale is divided into ones, even if only labelled in multiples of two) and simple tables [S1]
- answer questions by counting the number of objects in each category and sorting the categories by quantity [S2]
- answer questions about totalling and begin to compare simple categorical data (e.g. when the pictures or blocks are adjacent) [S2].

6.7.6 Solve problems and reason mathematically

Pupils working at the expected standards are able to:

- solve problems by applying their mathematics in a range of contexts (including money and measures, geometry and statistics) using the content described above; use and interpret mathematical symbols and diagrams; and begin to communicate their reasoning; for example:
  - use place value and number facts to solve problems (e.g. $40 + \square = 70$) [N6,C1]
  - use inverse operations to solve missing number problems for addition and subtraction (e.g. There were some people on a bus, six got off leaving seventeen people on the bus. How many were on the bus to start with?) [C3]
  - solve simple 2-step problems with addition and subtraction, which require some retrieval (e.g. There are 12 kittens in a basket, 6 jump out and only 2 jump back in; how many are in the basket now?) [C4]
  - solve simple problems involving multiplication and division (e.g. Ahmed buys 3 packs of apples. There are 4 apples in each pack. How many apples does he buy?) [C8]
  - solve problems with one or two computational steps using addition, subtraction, multiplication and division and a combination of these (e.g. Joe has 2 packs of 6 stickers; Mina gives him 2 more stickers; how many stickers does he have altogether?) [C4, C8]
  - solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change (e.g. Identify three coins with a total value of 24p or find the two items which cost exactly £1 altogether from a list such as: 70p, 40p, 50p and 30p) [M3, M9].

7. Diversity and inclusion

The Equality Act 2010 sets out the principles by which national curriculum assessments 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 assessments 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' (Regulatory framework for national assessment, published by Ofqual 2011).

The end of key stage 1 mathematics test should:

- use appropriate means to allow all pupils to demonstrate their mathematical fluency, solving problems and reasoning
- provide a suitable challenge for all pupils and give every pupil the opportunity to achieve as high a standard as possible
- provide opportunities for all pupils to achieve, irrespective of gender, disability or special educational need, social, linguistic or cultural backgrounds
- use materials that are familiar to pupils and for which they are adequately prepared
- not be detrimental to pupils' 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' (New language accessibility guidance, published by Ofqual 2012).

In order to improve general accessibility for all pupils, where possible, questions will be placed in order of difficulty. As with all national curriculum tests, attempts have been made to make the question rubric as accessible as possible for all pupils, 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 pupils 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 pupils 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 1 assessments as set out in the ARA will be available to eligible pupils as required.

Teachers are able to vary the administration arrangements for pupils according to their need. Where arrangements are varied, it should follow normal classroom practice for assessments of this type.

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 pupils as a test paper or test booklet is called a component. Some tests may have two or more components that each pupil needs to sit to complete the test.
construct irrelevant variance	Construct irrelevant variance is the variation in pupils' test scores that does not come from their knowledge of the content domain. It can result in pupils gaining fewer marks than their knowledge would suggest or lead to the award of more marks than 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 pupils to answer correctly without having the required subject knowledge.
content domain	The body of subject knowledge to be assessed by the test
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 programme of study	The national curriculum programme of study is the statutory description of subject knowledge, skills and understanding for a given key stage. The key stage 1 and 2 programmes of study are published online at: https://www.gov.uk/government/publications/national-curriculum-in-england-primary-curriculum
performance descriptor	A performance descriptor is a description of the typical characteristics of pupils 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.

raw score	A raw score is 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 pupil 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 into a score on a fixed, defined scale is a scaled score. This allows performance to be reported on a consistent scale for all pupils, 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 been 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	The standard error of measurement is 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 pupil had that pupil taken the test repeatedly under the same conditions.
standard setting	The process of applying the standard to a particular test to determine the score required for a pupil 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 containing a test specification
test specification	A detailed description of what is to be included in a test in any single cycle of development
truncate	To shorten by removing ends

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Standards & Testing Agency

About this publication

Who is it for?

This document is aimed primarily at those responsible for developing the key stage 1 national curriculum test in mathematics. It may also be of interest to schools with pupils in key stage 1 and other education professionals.

What does it cover?

The framework provides detailed information to ensure an appropriate test is developed, including the:

- content domain
- cognitive domain
- test specification
- test performance descriptors.

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