Department for Education

National Centre for Excellence in the Teaching of Mathematics

# Mathematics guidance: key stages 1 and 2

## Non-statutory guidance for the national curriculum in England

## Introduction

June 2020

# Acknowledgements

We would like to thank and acknowledge the following people involved in the production of this publication:

Dr Debbie Morgan (Director for Primary Mathematics, NCETM); Clare Christie (Maths Consultant and Lead Practitioner, Ashley Down Primary School); Professor Anne Watson (Emeritus Professor in Mathematics Education, University of Oxford); Dr Yvette Sturdy (Development Editor, DiGiV8 Ltd.); Jalita Jacobsen (Editor and Illustrator); Steve Evans (Illustrator); Dr Xinfeng Huang, (Associate Professor, Shanghai Normal University); Elizabeth Lambert (Assistant Director for Primary, NCETM); Emma Patman (Assistant Director for Primary, NCETM); Carol Knights (Director for Secondary, NCETM); Kris Dong (Deputy Head of Primary, National Nord Anglia Chinese International School Shanghai); Ellie Swidryk (Mastery Specialist Teacher, Shrubland Street Primary School); Thomas Hassall (Mastery Specialist Teacher, St Andrew's Junior School); David Byron (Mastery Specialist Teacher, Cathedral Primary School, Bristol); Thomas Henesey (Mastery Specialist Teacher, Kingsholm C of E Primary School); Ione Haroun (Mastery Specialist Teacher, St White's Primary School); Farzana Khan (Mastery Specialist Teacher, Astwood Bank Primary School); Joanne Lane (Mastery Specialist Teacher, Stourport Primary Academy); Cat Potter (Head of Mathematics, Trinity Academy Bristol).

## What is included in this document?

This document is introduction to the full publication *Mathematics guidance: key stages 1 and 2 Non-statutory guidance for the national curriculum in England.*

# Introduction

## Aims of the publication

This publication aims to:

- bring greater coherence to the national curriculum by exposing core concepts in the national curriculum and demonstrating progression from year 1 to year 6
- summarise the most important knowledge and understanding within each year group and important connections between these mathematical topics

## What is included in the publication?

This publication identifies the most important conceptual knowledge and understanding that pupils need as they progress from year 1 to year 6. These important concepts are referred to as ready-to-progress criteria and provide a coherent, linked framework to support pupils' mastery of the primary mathematics curriculum. The ready-to-progress criteria for all year groups are provided at the end of the introduction (**Ready-to-progress criteria**), and each criterion is explained within the corresponding year-group chapter.

Please note that the publication does not address the whole of the primary curriculum, but only the areas that have been identified as a priority. It is still a statutory requirement that the whole of the curriculum is taught. However, by meeting the ready-to-progress criteria, pupils will be able to more easily access many of the elements of the curriculum that are not covered by this guidance.

### The year-group chapters

Each chapter begins with a table that shows how each ready-to-progress criterion for that year group links to pupils' prior knowledge and future applications. Each year-group chapter then provides:

- **teaching guidance** for each ready-to-progress criterion, including core mathematical representations, language structures and discussion of connections to other criteria
- **example assessment questions** for each ready-to-progress criterion
- guidance on the development of **calculation and fluency**

#### Representations of the mathematics

A core set of representations have been selected to expose important mathematical structures and ideas, and make them accessible to pupils. Consistent use of the same representations across year groups help to connect prior learning to new learning. The

example below demonstrates the use of tens frames and counters extended from year 1, where each counter represents 1 and a filled frame represents 10, to year 4 where each counter represents 100 a filled frame represents 1,000.

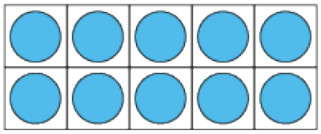

**Figure 1: using a tens frame and counters**

**Figure 2: using a tens frame and counters**

## Language structures

The development and use of precise and accurate language in mathematics is important, so the guidance includes 'Language focus' features. These provide suggested sentence structures for pupils to use to capture, connect and apply important mathematical ideas. Once pupils have learnt to use a core sentence structure, they should be able to adapt and reason with it to apply their understanding in new contexts.

**Language focus**

"8 plus 6 is equal to 14, so 8 hundreds plus 6 hundreds is equal to 14 hundreds."

"14 hundreds is equal to 1,400."

## Making Connections

'Making connections' features discuss important connections between ready-to-progress criteria within a year group. The example below describes how division with remainders is connected to multiplication and fractions criteria.

**Making connections**

Pupils must have automatic recall of multiplication facts and related division facts, and be able to recognise multiples (**4NF–1**) before they can solve division problems with remainders. For example, to calculate $55 \div 7$, pupils need to be able to identify the largest multiple of 7 that is less than 55 (in this case 49). They must then recall how many sevens there are in 49, and calculate the remainder.

Converting improper fractions to mixed numbers (**4F–2**) relies on solving division problems with remainders. For example, converting $\frac{19}{6}$ to a mixed number depends on the calculation $19 \div 6 = 3 \text{ r } 1$.

### Assessment

Example assessment questions are provided for each ready to progress criterion. These questions demonstrate the depth and breadth of understanding that pupils need to be ready to progress to the next year group.

### Calculation and fluency

Each chapter ends with a section on the development of calculation methods and fluency. Pupils should be able to choose and use efficient calculation methods for addition, subtraction, multiplication and division. They must also have automatic recall of a core set of multiplicative and additive facts to enable them to focus on learning new concepts. **Appendix: number facts fluency overview** sets out when the multiplication tables and core additive facts should be taught, and in what order.

## How to use this publication

This publication can support long-term, medium-term and short-term planning, and assessment. At the long-term planning stage, this guidance can be used to ensure that the most important elements that underpin the curriculum are covered at the right time, and to ensure that there is continuity and consistency for pupils as they progress from one year group to the next. At the medium-term planning stage, teachers can use the guidance to inform decisions on how much teaching time to set aside for the different parts of the curriculum. Teaching time can be weighted towards the ready-to-progress criteria. The ready-to-progress tables at the start of each year group and the ‘Making connections’ features support medium-term planning by demonstrating how to make connections between mathematical ideas and develop understanding based on logical progression. At the short-term planning stage, the guidance can be used to inform teaching strategy, and the representations and ‘Language focus’ features can be used to make concepts more accessible to pupils.

The publication can also be used to support transition conversations between teachers of adjacent year groups, so that class teachers understand what pupils have been taught in the previous year group, how they have been taught it, and how effectively pupils have understood and remembered it.

## Ready-to-progress criteria and the curriculum

The ready-to-progress criteria in this document are organised into 6 strands, each of which has its own code for ease of identification. These are listed below. *Measurement* and *Statistics* are integrated as applications of number criteria, and elements of measurement that relate to shape are included in the *Geometry* strand.

| Ready-to-progress criteria strands | Code |
|---|---|
| Number and place value | **NPV** |
| Number facts | **NF** |
| Addition and subtraction | **AS** |
| Multiplication and division | **MD** |
| Fractions | **F** |
| Geometry | **G** |

## Special educational needs and disability (SEND)

Pupils should have access to a broad and balanced curriculum. The *National Curriculum Inclusion Statement* states that teachers should set high expectations for every pupil, whatever their prior attainment. Teachers should use appropriate assessment to set targets which are deliberately ambitious. Potential areas of difficulty should be identified and addressed at the outset. Lessons should be planned to address potential areas of difficulty and to remove barriers to pupil achievement. In many cases, such planning will mean that pupils with SEN and disabilities will be able to study the full national curriculum. The guidance in this document will support planning for all SEND pupils by highlighting the most important concepts within the national curriculum so that teaching and targeted support can be weighted towards these.

# Ready-to-progress criteria: year 1 to year 6

The table below is a summary of the ready-to-progress criteria for all year groups.

| Strand | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 |
|---|---|---|---|---|---|---|
| **NPV** | **1NPV–1** Count within 100, forwards and backwards, starting with any number. | | **3NPV–1** Know that 10 tens are equivalent to 1 hundred, and that 100 is 10 times the size of 10; apply this to identify and work out how many 10s there are in other three-digit multiples of 10. → | **4NPV–1** Know that 10 hundreds are equivalent to 1 thousand, and that 1,000 is 10 times the size of 100; apply this to identify and work out how many 100s there are in other four-digit multiples of 100. → | **5NPV–1** Know that 10 tenths are equivalent to 1 one, and that 1 is 10 times the size of 0.1.<br>Know that 100 hundredths are equivalent to 1 one, and that 1 is 100 times the size of 0.01.<br>Know that 10 hundredths are equivalent to 1 tenth, and that 0.1 is 10 times the size of 0.01. → | **6NPV–1** Understand the relationship between powers of 10 from 1 hundredth to 10 million, and use this to make a given number 10, 100, 1,000, 1 tenth, 1 hundredth or 1 thousandth times the size (multiply and divide by 10, 100 and 1,000). |
| | | **2NPV–1** Recognise the place value of each digit in two-digit numbers, and compose and decompose two-digit numbers using standard and non-standard partitioning. → | **3NPV–2** Recognise the place value of each digit in *three*-digit numbers, and compose and decompose *three*-digit numbers using standard and non-standard partitioning. → | **4NPV–2** Recognise the place value of each digit in *four*-digit numbers, and compose and decompose *four*-digit numbers using standard and non-standard partitioning. → | **5NPV–2** Recognise the place value of each digit in numbers with up to 2 decimal places, and compose and decompose numbers with up to 2 decimal places using standard and non-standard partitioning. → | **6NPV–2** Recognise the place value of each digit in numbers up to 10 million, including decimal fractions, and compose and decompose numbers up to 10 million using standard and non-standard partitioning. |
| | **1NPV–2** Reason about the location of numbers to 20 within the linear number system, including comparing using < > and = → | **2NPV–2** Reason about the location of any two-digit number in the linear number system, including identifying the previous and next multiple of 10. → | **3NPV–3** Reason about the location of any *three*-digit number in the linear number system, including identifying the previous and next multiple of 100 and 10. → | **4NPV–3** Reason about the location of any *four*-digit number in the linear number system, including identifying the previous and next multiple of 1,000 and 100, and rounding to the nearest of each. → | **5NPV–3** Reason about the location of any number with up to 2 decimals places in the linear number system, including identifying the previous and next multiple of 1 and 0.1 and rounding to the nearest of each. → | **6NPV–3** Reason about the location of any number up to 10 million, including decimal fractions, in the linear number system, and round numbers, as appropriate, including in contexts. |

| Strand | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 |
|---|---|---|---|---|---|---|
| **NPV** | | | **3NPV–4** Divide 100 into 2, 4, 5 and 10 equal parts, and read scales/number lines marked in multiples of 100 with 2, 4, 5 and 10 equal parts. → | **4NPV–4** Divide 1,000 into 2, 4, 5 and 10 equal parts, and read scales/number lines marked in multiples of 1,000 with 2, 4, 5 and 10 equal parts. → | **5NPV–4** Divide 1 into 2, 4, 5 and 10 equal parts, and read scales/number lines marked in units of 1 with 2, 4, 5 and 10 equal parts. → | **6NPV–4** Divide powers of 10, from 1 hundredth to 10 million, into 2, 4, 5 and 10 equal parts, and read scales/number lines with labelled intervals divided into 2, 4, 5 and 10 equal parts. |
| | | | | | **5NPV–5** Convert between units of measure, including using common decimals and fractions. | |
| **NF** | **1NF–1** Develop fluency in addition and subtraction facts within 10. → | **2NF–1** Secure fluency in addition and subtraction facts within 10, through continued practice. → | **3NF–1** Secure fluency in addition and subtraction facts that bridge 10, through continued practice. | | | |
| | **1NF–2** Count forwards and backwards in multiples of 2, 5 and 10, up to 10 multiples, beginning with any multiple, and count forwards and backwards through the odd numbers. → | | **3NF–2** Recall multiplication facts, and corresponding division facts, in the 10, 5, 2, 4 and 8 multiplication tables, and recognise products in these multiplication tables as multiples of the corresponding number. → | **4NF–1** Recall multiplication and division facts up to $12 \times 12$, and recognise products in multiplication tables as multiples of the corresponding number. → | **5NF–1** Secure fluency in multiplication table facts, and corresponding division facts, through continued practice. | |
| | | | | **4NF–2** Solve division problems, with two-digit dividends and one-digit divisors, that involve remainders, and interpret remainders appropriately according to the context. | | |
| | | | **3NF–3** Apply place-value knowledge to known additive and multiplicative number facts (scaling facts by 10). → | **4NF–3** Apply place-value knowledge to known additive and multiplicative number facts (scaling facts by 100) → | **5NF–2** Apply place-value knowledge to known additive and multiplicative number facts (scaling facts by 1 tenth or 1 hundredth). | |

| Strand | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 |
|---|---|---|---|---|---|---|
| **AS** | **1AS–1** Compose numbers to 10 from 2 parts, and partition numbers to 10 into parts, including recognising odd and even numbers. | **2AS–1** Add and subtract across 10. | **3AS–1** Calculate complements to 100. | | | **6AS/MD–1** Understand that 2 numbers can be related additively or multiplicatively, and quantify additive and multiplicative relationships (multiplicative relationships restricted to multiplication by a whole number). |
| | **1AS–2** Read, write and interpret equations containing addition (＋), subtraction (－) and equals (＝) symbols, and relate additive expressions and equations to real-life contexts. | **2AS–2** Recognise the subtraction structure of 'difference' and answer questions of the form, "How many more…?". | **3AS–2** Add and subtract up to three-digit numbers using columnar methods. | | | **6AS/MD–2** Use a given additive or multiplicative calculation to derive or complete a related calculation, using arithmetic properties, inverse relationships, and place-value understanding. |
| | | **2AS–3** Add and subtract within 100 by applying related one-digit addition and subtraction facts: add and subtract only ones or only tens to/from a two-digit number. | **3AS–3** Manipulate the additive relationship:<br>Understand the inverse relationship between addition and subtraction, and how both relate to the part–part–whole structure.<br>Understand and use the commutative property of addition, and understand the related property for subtraction. | | | **6AS/MD–3** Solve problems involving ratio relationships. |
| | | **2AS–4** Add and subtract within 100 by applying related one-digit addition and subtraction facts: add and subtract any 2 two-digit numbers. | | | | **6AS/MD–4** Solve problems with 2 unknowns. |

| Strand | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 |
|---|---|---|---|---|---|---|
| **MD** | | **2MD–1** Recognise repeated addition contexts, representing them with multiplication equations and calculating the product, within the 2, 5 and 10 multiplication tables. | **3MD–1** Apply known multiplication and division facts to solve contextual problems with different structures, including quotitive and partitive division. | **4MD–1** Multiply and divide whole numbers by 10 and 100 (keeping to whole number quotients); understand this as equivalent to making a number 10 or 100 times the size. → | **5MD–1** Multiply and divide numbers by 10 and 100; understand this as equivalent to making a number 10 or 100 times the size, or 1 tenth or 1 hundredth times the size. | For year 6, MD ready-to-progress criteria are combined with AS ready-to-progress criteria (please see above). |
| | | **2MD–2** Relate grouping problems where the number of groups is unknown to multiplication equations with a missing factor, and to division equations (quotitive division). | | **4MD–2** Manipulate multiplication and division equations, and understand and apply the commutative property of multiplication. | **5MD–2** Find factors and multiples of positive whole numbers, including common factors and common multiples, and express a given number as a product of 2 or 3 factors. | |
| | | | | **4MD–3** Understand and apply the distributive property of multiplication. → | **5MD–3** Multiply any whole number with up to 4 digits by any one-digit number using a formal written method. | |
| | | | | | **5MD–4** Divide a number with up to 4 digits by a one-digit number using a formal written method, and interpret remainders appropriately for the context. | |

| Strand | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 |
|---|---|---|---|---|---|---|
| **F** | | | **3F–1** Interpret and write proper fractions to represent 1 or several parts of a whole that is divided into equal parts. | | | **6F–1** Recognise when fractions can be simplified, and use common factors to simplify fractions. |
| | | | **3F–2** Find unit fractions of quantities using known division facts (multiplication tables fluency). → | | **5F–1** Find non-unit fractions of quantities. | **6F–2** Express fractions in a common denomination and use this to compare fractions that are similar in value. |
| | | | **3F–3** Reason about the location of any fraction within 1 in the linear number system. → | **4F–1** Reason about the location of mixed numbers in the linear number system. | | **6F–3** Compare fractions with different denominators, including fractions greater than 1, using reasoning, and choose between reasoning and common denomination as a comparison strategy. |
| | | | | **4F–2** Convert mixed numbers to improper fractions and vice versa. | **5F–2** Find equivalent fractions and understand that they have the same value and the same position in the linear number system. | |
| | | | **3F–4** Add and subtract fractions with the same denominator, within 1. → | **4F–3** Add and subtract improper and mixed fractions with the same denominator, including bridging whole numbers. | **5F–3** Recall decimal fraction equivalents for $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{5}$ and $\frac{1}{10}$, and for multiples of these proper fractions. | |
| **G** | **1G–1** Recognise common 2D and 3D shapes presented in different orientations, and know that rectangles, triangles, cuboids and pyramids are not always similar to one another. → | **2G–1** Use precise language to describe the properties of 2D and 3D shapes, and compare shapes by reasoning about similarities and differences in properties. → | **3G–1** Recognise right angles as a property of shape or a description of a turn, and identify right angles in 2D shapes presented in different orientations. | | **5G–1** Compare angles, estimate and measure angles in degrees (°) and draw angles of a given size. | |

| Strand | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 |
|---|---|---|---|---|---|---|
| G | | | | | **5G–2** Compare areas and calculate the area of rectangles (including squares) using standard units. | |
| | **1G–2** Compose 2D and 3D shapes from smaller shapes to match an example, including manipulating shapes to place them in particular orientations. → | | **3G–2** Draw polygons by joining marked points, and identify parallel and perpendicular sides. → | **4G–1** Draw polygons, specified by coordinates in the first quadrant, and translate within the first quadrant. → | | **6G–1** Draw, compose, and decompose shapes according to given properties, including dimensions, angles and area, and solve related problems. |
| | | | | **4G–2** Identify regular polygons, including equilateral triangles and squares, as those in which the side-lengths are equal and the angles are equal. Find the perimeter of regular and irregular polygons. | | |
| | | | | **4G–3** Identify line symmetry in 2D shapes presented in different orientations. Reflect shapes in a line of symmetry and complete a symmetric figure or pattern with respect to a specified line of symmetry. | | |

Department for Education

National Centre for Excellence in the Teaching of Mathematics

© Crown copyright 2020

This publication (not including logos) is licensed under the terms of the Open Government Licence v3.0 except where otherwise stated. Where we have identified any third party copyright information you will need to obtain permission from the copyright holders concerned.

To view this licence:

visit www.nationalarchives.gov.uk/doc/open-government-licence/version/3

email psi@nationalarchives.gsi.gov.uk

write to Information Policy Team, The National Archives, Kew, London, TW9 4DU

About this publication:

enquiries www.education.gov.uk/contactus

download www.gov.uk/government/publications

Reference: DfE-00109-2020

Follow us on Twitter: @educationgovuk

Like us on Facebook: facebook.com/educationgovuk