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

Year 2

June 2020

What is included in this document?

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

An overview of the ready-to-progress criteria for all year groups is provided below, followed by the specific guidance for year 2.

To find out more about how to use this document, please read the introductory chapter.

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. Know that 100 hundredths are equivalent to 1 one, and that 1 is 100 times the size of 0.01. 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 12×12, 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: Understand the inverse relationship between addition and subtraction, and how both relate to the part–part–whole structure. 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.		

Year 2 guidance

Ready-to-progress criteria

Year 1 conceptual prerequesites	Year 2 ready-to-progress criteria	Future applications
Know that 10 ones are equivalent to 1 ten. Know that multiples of 10 are made up from a number of tens, for example, 50 is 5 tens.	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.	Compare and order numbers. Add and subtract using mental and formal written methods.
Place the numbers 1 to 9 on a marked, but unlabelled, 0 to 10 number line. Estimate the position of the numbers 1 to 9 on an unmarked 0 to 10 number line. Count forwards and backwards to and from 100.	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.	Compare and order numbers. Round whole numbers. Subtract ones from a multiple of 10, for example: $30-3=27$
Develop fluency in addition and subtraction facts within 10.	2NF–1 Secure fluency in addition and subtraction facts within 10, through continued practice.	All future additive calculation. Add within a column during columnar addition when the column sums to less than 10 (no regrouping). Subtract within a column during columnar subtraction when the minuend of the column is larger than the subtrahend (no exchanging).

Year 1 conceptual prerequesites	Year 2 ready-to-progress criteria	Future applications
Learn and use number bonds to 10, for example: $8+?=10$ Partition numbers within 10, for example: $5=2+3$	2AS–1 Add and subtract across 10, for example: $8+5=13$ $13-5=8$	Add and subtract within 100: add and subtract any 2 two-digit numbers, where the ones sum to 10 or more, for example: $26+37=63$ Use knowledge of unitising to add and subtract across other boundaries, for example: $1.3-0.5=0.8$ Add within a column during columnar addition when the column sums to more than 10 (regrouping), for example, for: $12\mathbf{6}+14\mathbf{8}$ Subtract within a column during columnar subtraction when the minuend of the column is smaller than the subtrahend (exchanging), for example, for: $45\mathbf{3}-12\mathbf{4}$
Solve missing addend problems within 10, for example: $4+\square=10$	2AS–2 Recognise the subtraction structure of 'difference' and answer questions of the form, "How many more…?".	Solve contextual subtraction problems for all three subtraction structures (reduction, partitioning and difference) and combining with other operations.
Add and subtract within 10, for example: $6+3=9$ $6-2=4$ Know that a multiple of 10 is made up from a number of tens, for example, 50 is 5 tens.	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.	Add and subtract using mental and formal written methods.

Year 1 conceptual prerequesites	Year 2 ready-to-progress criteria	Future applications
Add and subtract within 10. Know that a multiple of 10 is made up from a number of tens, for example, 50 is 5 tens.	**2AS–4** Add and subtract within 100 by applying related one-digit addition and subtraction facts: add and subtract any 2 two-digit numbers.	Add and subtract numbers greater than 100, recognising unitising, for example: $32 \text{ ones} + 23 \text{ ones} = 55 \text{ ones}$ so $32 \text{ tens} + 23 \text{ tens} = 55 \text{ tens}$ $320 + 230 = 550$
Count in multiples of 2, 5 and 10.	**2MD–1** Recognise repeated addition contexts, representing them with multiplication equations and calculating the product, within the 2, 5 and 10 multiplication tables.	Use multiplication to represent repeated addition contexts for other group sizes. Memorise multiplication tables.
Count in multiples of 2, 5 and 10 to find how many groups of 2, 5 or 10 there are in a particular quantity, set in everyday contexts.	**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).	Division with other divisors.
Recognise common 2D and 3D shapes presented in different orientations.	**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.	Identify similar shapes. Describe and compare angles. Draw polygons by joining marked points Identify parallel and perpendicular sides. Identify regular polygons Find the perimeter of regular and irregular polygons. Compare areas and calculate the area of rectangles (including squares) using standard units. Compare areas and calculate the area of rectangles (including squares) using standard units.

2NPV–1 Place value in two-digit numbers

Recognise the place value of each digit in two-digit numbers, and compose and decompose two-digit numbers using standard and non-standard partitioning.

2NPV–1 Teaching guidance

Pupils need to be able to connect the way two-digit numbers are written in numerals to their value. They should demonstrate their reasoning using full sentences.

Language focus

"This is the number 42. The 4 shows we have 4 groups of ten. The 2 shows we have 2 extra ones."

Pupils should recognise that 42, for example, can be composed either of 42 ones, or of 4 tens and 2 ones. They should be able to group objects into tens, with some left over ones, to count efficiently and to demonstrate an understanding of the number. Pupils need to be capable of identifying the total quantity in different representations of groups of ten and additional ones. Within these representations the relative positions of the tens and the ones should be varied.

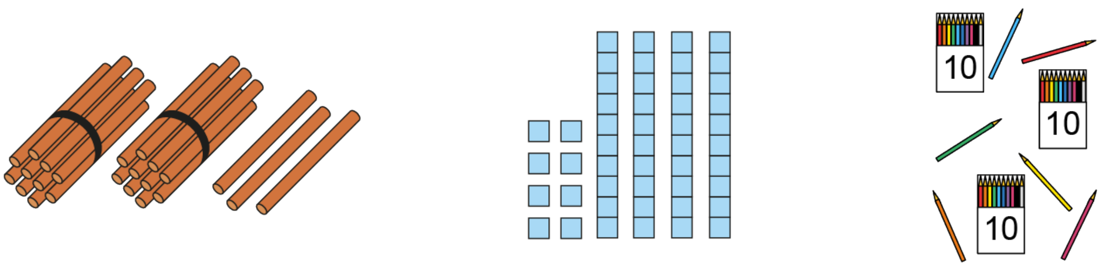


Figure 1: varied representations of two-digit numbers as groups of ten and additional ones

Pupils need to be able to partition two-digit numbers into tens and ones parts, and represent this using diagrams, and addition and subtraction equations.

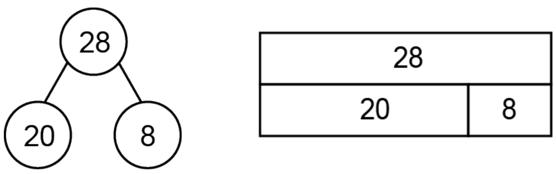


Figure 2: partitioning 28 into 20 and 8

$20 + 8 = 28 \quad 28 - 20 = 8$

$8 + 20 = 28 \quad 28 - 8 = 20$

$28 = 20 + 8 \quad 8 = 28 - 20$

$28 = 8 + 20 \quad 20 = 28 - 8$

It is also important for pupils to be able to think flexibly about number, learning to:

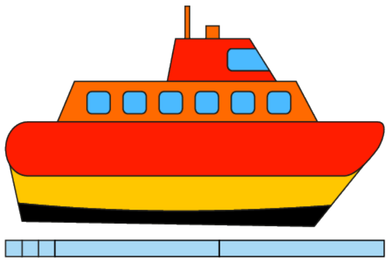
- partition into a multiple of ten and another two-digit number, in different ways (for example, 68 can be partitioned into 50 and 18, into 40 and 28, and so on)
- partition into a two-digit number and a one-digit number, in different ways (for example, 68 can be partitioned into 67 and 1, 66 and 2, and so on)

Making connections

Learning about place value should include connections with addition and subtraction in the form of partitioning two-digit numbers according to tens and ones, and writing associated additive equations. Pupils should also partition two-digit numbers in ways other than according to place value to prepare them to solve addition and subtraction calculations involving two-digit numbers.

2NPV–1 Example assessment questions

1. Daisy has used 10cm rods and 1cm cubes to measure the length of this toy boat. How long is the boat?



2. What is the total value of these coins?

3. Monika watches a cartoon for 20 minutes and a news programme for 5 minutes. How long does she watch television for?

4. Fill in the missing numbers.

   $47 - \square = 7$ $\square = 8 + 60$

5. Jed collects 38 conkers and gives 8 of them to Dylan. How many conkers does Jed have left?

2NPV–2 Two-digit numbers in the linear number system

Reason about the location of any two-digit number in the linear number system, including identifying the previous and next multiple of 10.

2NPV–2 Teaching guidance

Pupils need to be able to identify or place two-digit numbers on marked number lines. They should use efficient strategies and appropriate reasoning, including working backwards from a multiple of 10.

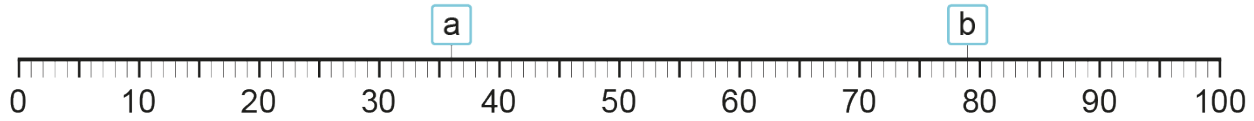


Figure 3: identifying 36 and 79 on a marked 0 to 100 number line

Language focus

"*a* is 36 because it is one more than the midpoint of 35."

"*b* is 79 because it is one less than 80."

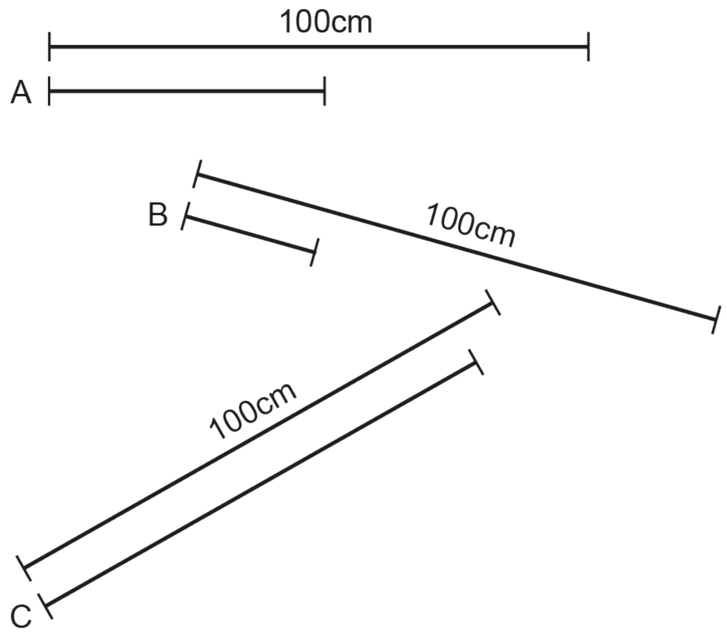
Pupils should also be able to estimate the value or position of two-digit numbers on unmarked numbers lines, using appropriate proportional reasoning, rather than counting on from a start point or back from an end point. For example, here pupils should reason: "60 is about *here* on the number line because it's just over half way".

Figure 4: placing 60 on an unmarked 0 to 100 number line

To prepare for future work on rounding, pupils should also learn to identify which 2 multiples of 10 a given two-digit number is between.

2NPV–2 Example assessment questions

1. Look at lines A, B and C. Estimate how long they are by comparing them to the 100cm lines?

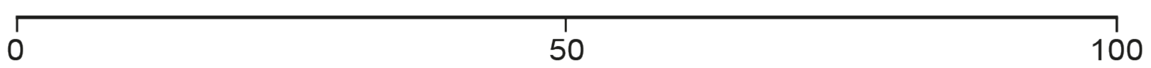


2. The table shows the results of a survey which asked pupils to choose their favourite sport. Which sports were chosen by between 20 and 30 pupils?

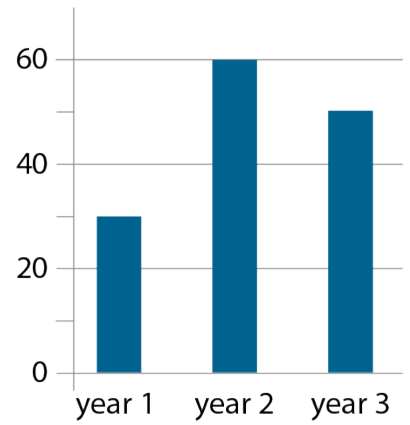
Favourite sport	Number of pupils
netball	24
basketball	19
tennis	12
football	32
hockey	6
swimming	28
gymnastics	15

3. Sophie thinks of a number. She says, “My number is between 40 and 50. It has 7 in the ones place.” What is Sophie’s number?

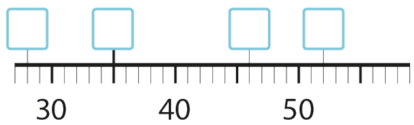
4. Estimate the position of 60 on this number line:



5. The bar chart shows the number of pupils in each year-group in a school. How many pupils are in year 1?



6. Fill in the missing numbers.



2NF–1 Fluently add and subtract within 10

Secure fluency in addition and subtraction facts within 10, through continued practice.

2NF–1 Teaching guidance

In year 1, pupils should have learnt to add and subtract fluently within 10 (**1NF–1**). However, pupils may not still be fluent by the beginning of year 2, so this fluency should now be secured and maintained. Pupils should practise additive calculation within 10 until they have automatic recall of the additive facts. Fluency in these facts is required for pupils to succeed with addition and subtraction across 10 (**2AS–1**) and for additive calculation with larger numbers (**2AS–3** and **2AS–4**).

The 66 addition facts within 10 are shown on the grid below. The number of addition facts to be learnt is reduced when commutativity is applied and pupils recognise that 3 + 2, for example, is the same as 2 + 3. Pupils must also have automatic recall of the corresponding subtraction facts, for example 5 – 3 and 5 – 2.

+	0	1	2	3	4	5	6	7	8	9	10
0	0+0	0+1	0+2	0+3	0+4	0+5	0+6	0+7	0+8	0+9	0+10
1	1+0	1+1	1+2	1+3	1+4	1+5	1+6	1+7	1+8	1+9	
2	2+0	2+1	2+2	2+3	2+4	2+5	2+6	2+7	2+8		
3	3+0	3+1	3+2	3+3	3+4	3+5	3+6	3+7			
4	4+0	4+1	4+2	4+3	4+4	4+5	4+6				
5	5+0	5+1	5+2	5+3	5+4	5+5					
6	6+0	6+1	6+2	6+3	6+4						
7	7+0	7+1	7+2	7+3							
8	8+0	8+1	8+2								
9	9+0	9+1									
10	10+0										

Making connections

Fluency in these addition and subtraction facts is required for addition and subtraction across 10 (2AS–1) and for additive calculation with larger numbers (2AS–3 and 2AS–4).

2NF–1 Assessment guidance

Assessment guidance: For pupils to have met criterion **2NF–1**, they need to be able to add and subtract within 10 without counting forwards or backwards in ones on their fingers, on a number line or in their heads. Pupils need to be able to automatically recall the facts. Teachers should assess pupils in small groups – simply providing the correct answers to calculations in a written test does not demonstrate that a pupil has met the criterion.

2AS–1 Add and subtract across 10

Add and subtract across 10, for example:

$8+5=13$

$13-5=8$

2AS–1 Teaching guidance

Pupils need to have a strategy for confidently and fluently carrying out calculations such as:

- $7+5=12$
- $15-9=6$

For both addition and subtraction across 10, tens frames and partitioning diagrams can be used to support pupils as they learn about these strategies.

First, pupils should learn to add three one-digit numbers by making 10, for example, $7+3+2=10+2$. They can then relate this to addition of two numbers across 10, by partitioning one of the addends, for example $7+5=7+3+2$.

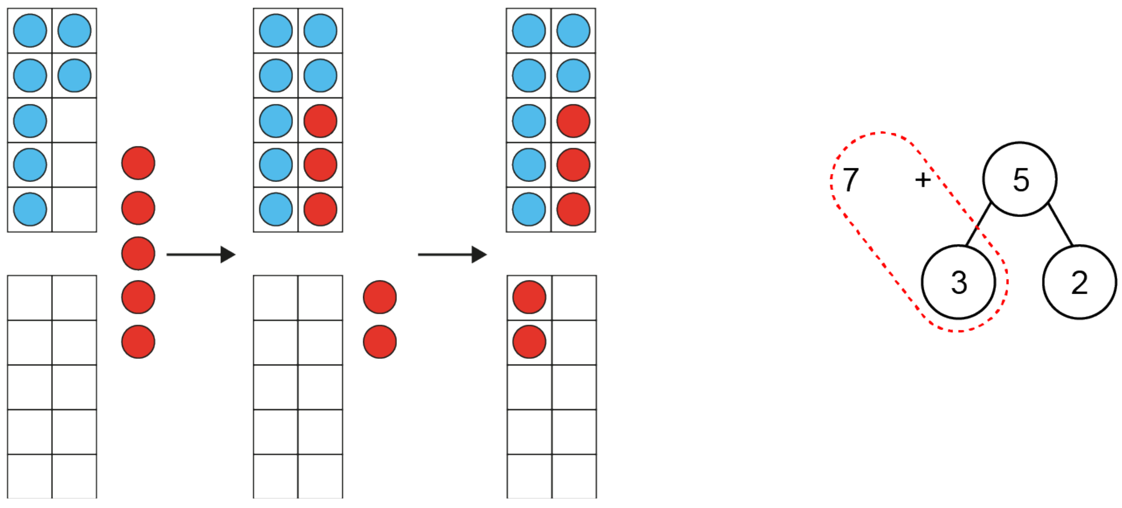
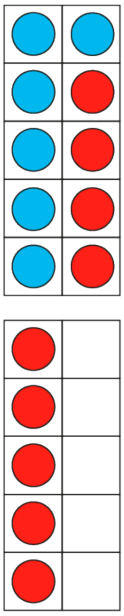


Figure 5: tens frames with counters, and a partitioning diagram, showing $7+5=12$

Pupils can subtract across 10 by using:

- the ‘subtracting through 10’ strategy (partitioning the subtrahend) – part of the subtrahend is subtracted to reach 10, then the rest of the subtrahend is subtracted from 10 or

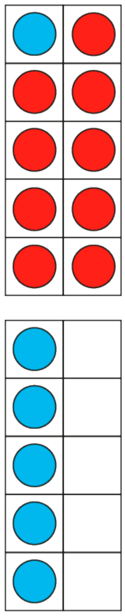
- the ‘subtracting from 10’ strategy (partitioning the minuend) – the subtrahend is subtracted from 10, then the difference between the minuend and 10 is added



15 – 9
5 4

15 − 5 = 10
10 − 4 = 6
so
15 − 9 = 6

Figure 6: using the ‘subtracting through 10’ strategy to calculate 15 minus 9



15 – 9
10 5

10 − 9 = 1
1 + 5 = 6
so
15 − 9 = 6

Figure 7: using the ‘subtracting from 10’ strategy to calculate 15 minus 9

You can find out more about fluency and recording for these calculations here in the calculation and fluency section: **2AS–1**

Making connections

This criterion depends on criterion **2NPV–1** where, as part of composing numbers according to place value, pupils learnt to:

- add a ten and some ones to make numbers between 11 and 19, for example: $10+3=13$
- subtract the ones from a number between 11 and 19 to make 10, for example: $13-3=10$

2AS–1 Example assessment questions

1. Amisha spends £5 on a book and £8 on a T-shirt. How much does she spend altogether?
2. I have a 15cm length of ribbon. I cut off 6cm. How much ribbon is left?
3. I have 17 pencils. 9 have been sharpened. How many have not been sharpened?
4. A garden fence was 8m long. Then the gardener added 7 more metres of fencing. How long is the garden fence now?

Assessment guidance: For pupils to have met criterion **2AS–1**, they need to be able to add and subtract across 10 without counting forwards or backwards in ones on their fingers, on a number line or in their heads. Teachers should assess pupils in small groups – simply providing the correct answers to the example questions above does not demonstrate that a pupil has met the criterion. The full set of addition and subtraction facts which children need to be fluent in is shown in the appendix.

2AS–2 Solve comparative addition and difference problems

Recognise the subtraction structure of ‘difference’ and answer questions of the form, “How many more…?”.

2AS–2 Teaching guidance

Pupils need to be able to solve problems with missing addends using known number facts or calculation strategies, for example:

$19 + \boxed{} = 25$

Pupils need to be able to recognise problems about difference, and relate them to subtraction. For example, they should understand that they need to calculate $3 + \boxed{} = 5$ or $5 - 3 = \boxed{}$ to solve the problem: There are 5 red cars and 3 blue cars. What is the difference between the number of red cars and blue cars?

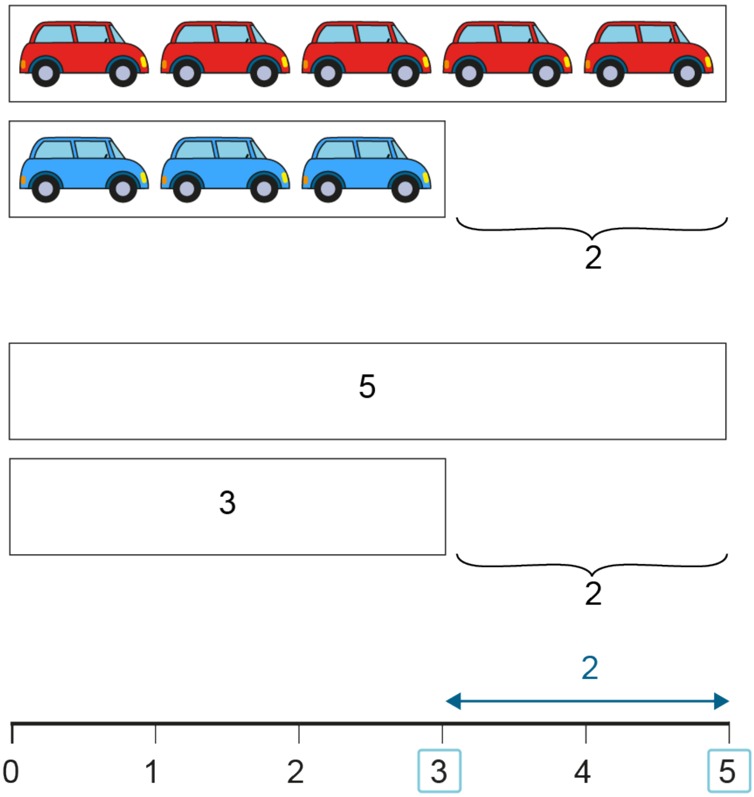
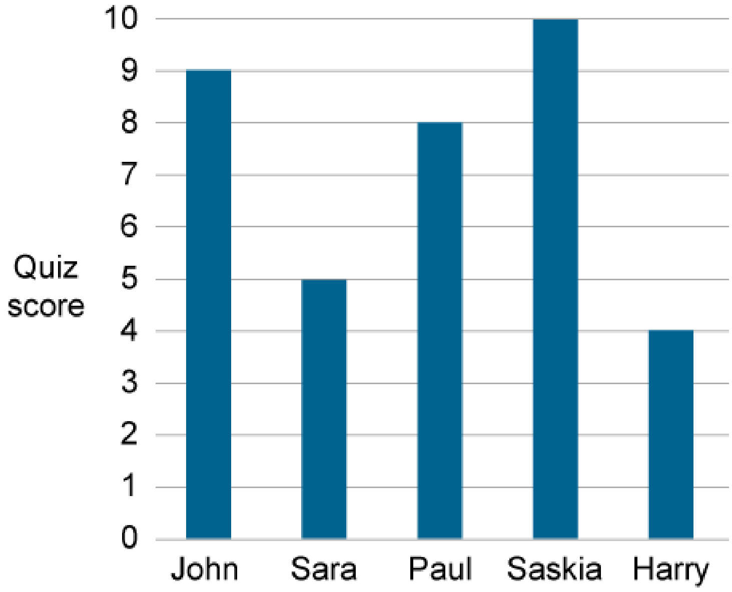


Figure 8: finding the difference – bar model and number line

Pupils should be able to recognise contextual problems involving finding a difference, phrased as ‘find the difference’, ‘how many more’ and ‘how many fewer’, such as those shown in the **2AS–2** below. Pupils may solve these problems by relating them to either a missing addend equation or to subtraction, applying known facts and strategies.

2AS–2 Example assessment questions

1. The bar chart shows how many points some pupils scored in a quiz.



   a. How many more points did John score than Sara?

   b. How many fewer points did Harry score than Saskia?

   c. What is the difference between Saskia’s score and Paul’s score?

2. I have £19 and want to buy a game which costs £25. How much more money do I need?
3. Felicity has 34 marbles and Dan has 30 marbles. What is the difference between the number of marbles they have?
4. It takes me 20 minutes to walk to school. So far I have been walking for 12 minutes. How much longer do I have to walk for?
5. Liam is 90cm tall. Karim is 80cm tall. How much taller is Liam than Karim?

2AS–3 Add and subtract within 100 – part 1

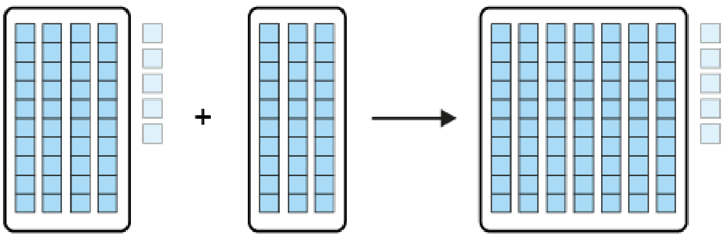
Add and subtract within 100 by applying related one-digit addition and subtraction facts: add and subtract only ones or only tens to/from a two-digit number.

2AS–3 Teaching guidance

Pupils should be able to apply known one-digit additive facts to:

- adding and subtracting 2 multiples of ten
  (for example, $40+30=70$ and $70-30=40$)
- adding and subtracting ones to/from a two-digit number
  (for example, $64+3=67$ and $67-3=64$)
- adding and subtracting multiples of ten to/from a two-digit number
  (for example, $45+30=75$ and $75-30=45$)
- the special case of subtracting ones from a multiple of ten, by using complements of 10
  (for example $30-3=27$)

Tens frames, Dienes and partitioning diagrams can be used to support pupils as they learn how to relate these calculations to one-digit calculations.



	4	+	3	=	7
so	40	+	30	=	70
	45	+	30	=	75

Figure 9: Dienes and equations to support adding a multiple of 10 to a two-digit number

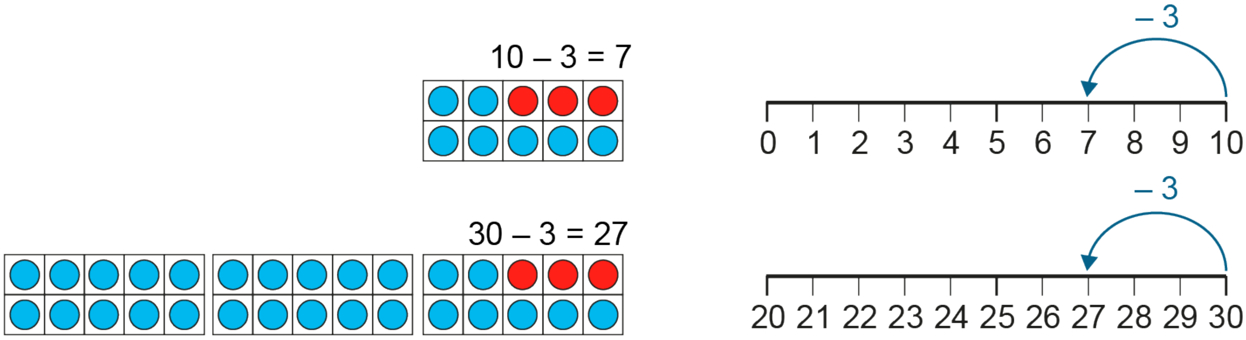


Figure 10: tens frames with counters, and number lines, to support subtracting ones from a multiple of 10

Throughout, pupils should use spoken language to demonstrate their reasoning.

Language focus

“4 plus 3 is equal to 7. So 4 tens and plus 3 tens is equal to 7 tens.”

“10 minus 3 is equal to 7. So 30 minus 3 is equal to 27.”

Pupils should also be able to apply strategies for addition or subtraction across 10, from above, to addition or subtraction bridging a multiple of 10.

You can find out more about fluency and recording for all of these calculation types here in the calculation and fluency section: **2AS–3**

Making connections

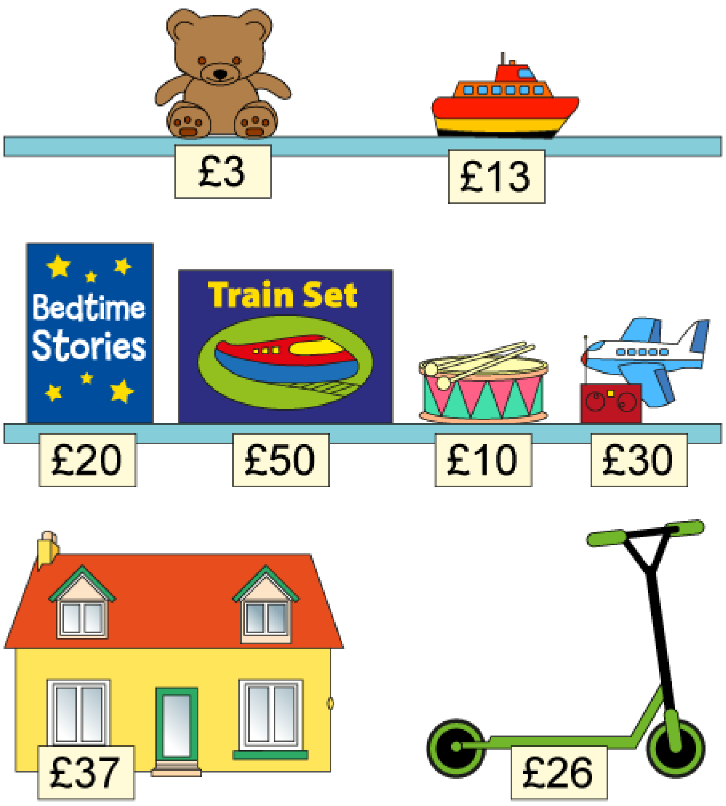
Learning to subtract ones from a multiple of 10 should be connected to pupils’ understanding of the location of two-digit numbers in the linear number system, for example pupils understand that 27 is 3 ‘before’ 30, so 30 – 3 = 27.

2AS–3 Example assessment questions

1. A bouncy ball costs 60p. Circle the coins which you could use to pay for it. Is there more than one answer?

2. Sophie's book has 50 pages. So far she has read 9 pages. How many more pages does Sophie have left to read?

3.



What is the total cost of:

a. the bedtime stories book and the train set?

b. the doll's house and the plane?

c. the scooter and the teddy?

d. the boat, the train set and the drum?

4. Oak class raise £68 for their class fund. They spend £40 on new paints. How much money do they have left?

Assessment guidance: Simply providing the correct answers to the example questions above does not demonstrate that pupils have met criterion **2AS–3**. For pupils to meet the criterion, they must be able to use known addition and subtraction facts within 10 to solve the calculations efficiently. Before using the questions above, assess pupils in small groups by watching how they solve calculations such as:

$40+30$	$31+5$	$20+59$	$46+4$
$90-40$	$48-6$	$72-30$	$80-3$

Language focus

"I know that 2 plus 5 is equal to 7, so 20 plus 50 is equal to 70. There are 9 ones as well, so 20 plus 59 is equal to 79."

Pupils who are using extensive written notes (for example, sketching 'jumping back' in tens on a number line as a way to solve $90-40$) have not yet met criterion **2AS–3**.

2AS–4 Add and subtract within 100 – part 2

Add and subtract within 100 by applying related one-digit addition and subtraction facts: add and subtract any 2 two-digit numbers.

2AS–4 Teaching guidance

As for **2AS–3**, Dienes and partitioning diagrams can be used to support pupils as they learn about strategies for carrying out these calculations.

To add 2 two-digit numbers, pupils need to combine one-digit addition facts with their understanding of two-digit place value. Pupils should first learn to add 2 multiples of ten and 2 ones before moving on to the addition of 2 two-digit numbers, for example:

- $40+20+5+3=60+8=68$
- $40+5+20+3=60+8=68$
- $45+23=60+8=68$

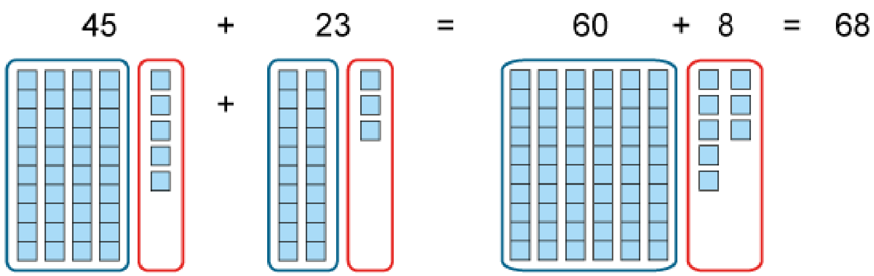


Figure 11: Dienes and an equation to support adding 2 two-digit numbers

Language focus

"First I partition both numbers. Then I add the tens. Then I add the ones.
Then I combine all of the tens and all of the ones."

Pupils can then learn to be more efficient, by partitioning just one addend, for example:

$$\begin{aligned} 45+23 &= 45+20+3 \\ &= 65+3 \end{aligned}$$

When pupils learn to subtract one two-digit number from another, the progression is similar to that for addition. Pupils can first learn to subtract a multiple of ten and some ones from a two-digit number, and then connect this to the subtraction of one two-digit number from another, for example:

- $45-20-3=25-3$
  $=22$
- $45-23=45-20-3$
  $=25-3$
  $=22$

or

- $45-3-20=42-20$
  $=22$
- $45-23=45-3-20$
  $=42-20$
  $=22$

There is an important difference compared to the addition strategy: pupils should not partition both two-digit numbers for subtraction as this can lead to errors, or calculations involving negative numbers, when bridging a multiple of 10, for example:

- $63-17 \neq 60-10+7-3$
- $63-17=60-10+3-7$

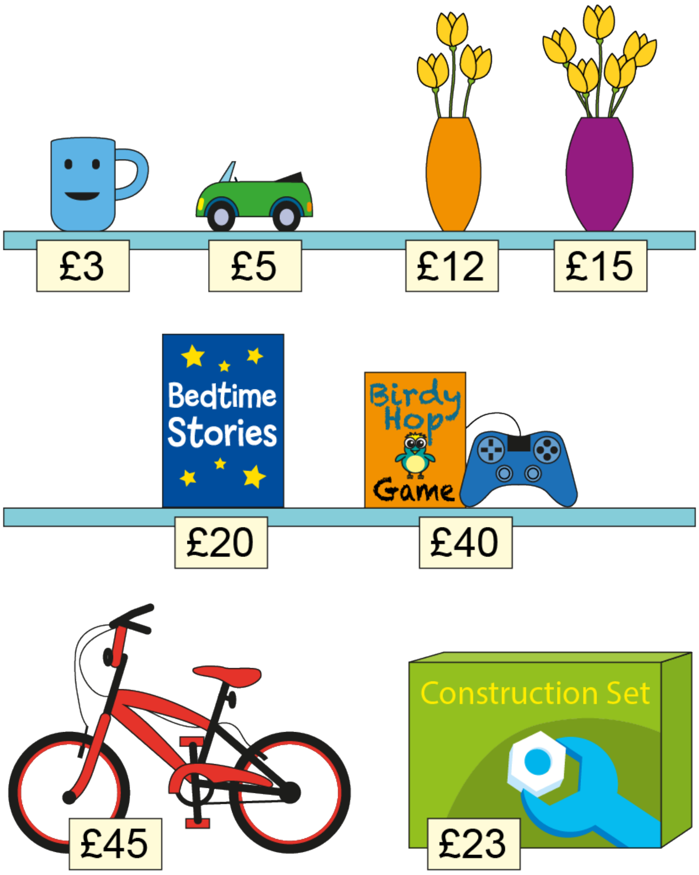
You can find out more about fluency and recording for addition and subtraction of two-digit numbers here in the calculation and fluency section: **2AS–4**

Making connections

Pupils should also be able to apply strategies for addition or subtraction across 10 (**2AS–1**) to calculations such as $26+37=63$ and $63-37=26$.

2AS–4 Example assessment questions

1.



a. Daisy spends £32 in the shop. Circle the 2 items she buys.

b. What is the total cost of the bicycle and construction set?

c. Jalal pays for the bicycle using a £50 note. How much change does he get?

d. Yu Yan wants to buy the construction set. She has saved £15. How much more money does Yu Yan need to save?

2MD–1 Multiplication as repeated addition

Recognise repeated addition contexts, representing them with multiplication equations and calculating the product, within the 2, 5 and 10 multiplication tables.

2MD–1 Teaching guidance

Pupils must first be able to recognise equal groups. To better understand and identify equal groups, pupils should initially explore both equal and unequal groups. Pupils should then learn to describe equal groups with words.

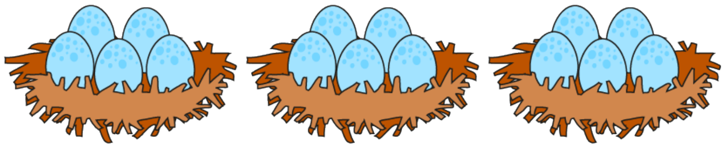


Figure 12: recognising equal groups – 3 groups of 5 eggs

Language focus

"There are 3 equal groups of eggs."

"There are 5 eggs in each group."

"There are 3 groups of 5."

Based on their existing additive knowledge, pupils should be able to represent equal-group contexts with repeated addition expressions, for example $5+5+5$. They should then learn to write multiplication expressions to represent the same contexts, for example 3×5. Pupils must be able to explain how each term in a multiplication expression links to the context it represents.

Pupils must also be able to understand equivalence between a repeated addition expression and a multiplication expression: $5+5+5=3\times5$.

Pupils should then learn to calculate the total number of items (the product), for contexts based on the 2, 5 and 10 multiplication tables, initially by skip counting. They should be able to write complete multiplication equations, for example $3\times5=15$, and explain how each term links to the context.

Language focus

"The 3 represents the number of groups."

"The 5 represents the number of eggs in each group."

"The 15 represents the total number of eggs."

Pupils should be able to relate multiplication to situations where the total number of items cannot be seen, for example by representing 3×5 with three 5-value counters.

Figure 13: three 5-value counters

You can find out more about fluency and recording for the 2, 5 and 10 multiplication tables here in the calculation and fluency section: 2MD–1.

Making connections

Pupils must be able to write and solve addition problems with 3 or more addends before they can connect repeated addition to multiplication.

2MD–1 Example assessment questions

1. Write these addition expressions as multiplication expressions. The first one has been completed for you.

   $5+5+5+5+5=5\times 5$

   $2+2+2+2+2=$ ______________

   $2+2+2=$ ______________

   $10+10+10=$ ______________

2. There are 7 year-groups in Winterdale School. Each year-group has 2 classes. How many classes are in the school?
3. Sally buys 3 cinema tickets. Each ticket costs £5. How much does Sally spend? Write the multiplication expression and calculate the cost.

4. There are 10 children sitting at each table in a dining hall. There are 8 tables. How many children are there?
5. The pictogram shows how many socks each child has. How many socks does Asif have?

6. Write a story to go with this equation.
   $6 \times 10 = 60$
7. Complete the calculations.
   $7 \times 5 = \square$ $10 \times 4 = \square$ $9 \times 2 = \square$

2MD–2 Grouping problems: missing factors and division

Relate grouping problems where the number of groups is unknown to multiplication equations with a missing factor, and to division equations (quotitive division).

2MD–2 Teaching guidance

Pupils need to be able to represent problems where the total quantity and group size is known, using multiplication equations with missing factors. For example, "There are 15 biscuits. If I put them into bags of 5, how many bags will I need?'' can be represented by the following equation:

$\boxed{} \times 5 = 15$

Pupils can use skip counting or their emerging 2, 5 and 10 multiplication table fluency to calculate the missing factor.

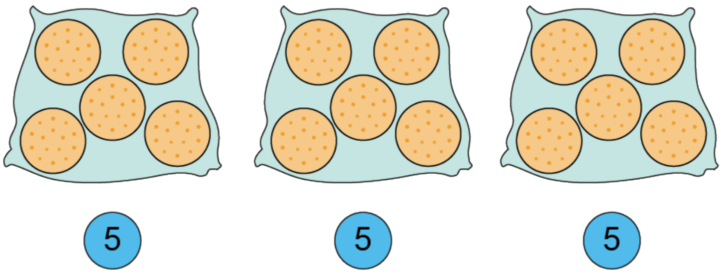


Figure 14: 3 bags of 5 biscuits alongside three 5-value counters

Pupils should then learn that unknown-factor problems can also be represented with division equations (quotitive division), for example, $15 \div 5 = \boxed{}$. They should be able to use skip counting or their multiplication-table fluency to find the quotient: $15 \div 5 = 3$.

Pupils should be able to describe how each term in the division equation links to the context and describe the division equation in terms of 'division into groups'.

Language focus

"The 15 represents the total number of biscuits."

"The 5 represents the number of biscuits in each bag."

"The 3 represents the number of bags."

"15 divided into groups of 5 is equal to 3."

Pupils also need to be able to solve division calculations that are not set in contexts. They should recognise that they need to skip count in the divisor (2, 5 or 10), or use the associated multiplication fact, to find the quotient. For example, to calculate $60 \div 10$, they can skip count in tens (counting the required number of tens) or apply the fact that $6 \times 10 = 60$.

You can find out more about fluency and recording for division by 2, 5 or 10 here in the calculation and fluency section: **2MD–2**

2MD–2 Example assessment questions

1. Miss Robinson asked Harry to get 60 apples from the kitchen. The apples come in bags of 10. How many bags does Harry need to get?
2. Diego has some 5p coins. He has 40p altogether. How many 5p coins does Diego have?
3. The pictogram shows how many socks each child has.

Lena has 8 socks. How would this be represented on the pictogram? Draw it.

4. There are 5 balloons in a pack. I need 15 balloons for my party. How many bags should I buy?
5. Fill in the missing numbers.
   $\square \times 5 = 30$ $\qquad$ $50 \div 10 = \square$ $\qquad$ $2 \times \square = 14$

2G–1 Describe and compare 2D and 3D shapes

Use precise language to describe the properties of 2D and 3D shapes, and compare shapes by reasoning about similarities and differences in properties.

2G–1 Teaching guidance

Building on 1G–1, pupils should continue to explore and discuss common 2D and 3D shapes, now extending to include quadrilaterals and other polygons, and cuboids, prisms and cones.

Pupils must now learn to use precise language to describe 2D shapes, including the terms ’sides’ and ‘vertex’/’vertices’. They should learn to identify the sides of a given 2D shape and to identify a vertex as a point where two sides meet.

Pupils must learn that a polygon is a 2D shape which has only straight sides and then learn to identify a given polygon by counting the number sides (or vertices). Pupils should practise running their finger along each side as they count the sides (or practise touching each vertex as they count the vertices). Later, pupils may mark off the sides or vertices on an image as they count. It is important that they learn to count the sides/vertices accurately, counting each once and only once. Pupils must know that it is the number of sides/vertices that determines the type of polygon, rather than whether the given shape looks like their mental image of a particular polygon. For example, although pupils may informally describe the shape below as “like a square with 2 corners cut off”, they should be able to recognise and explain that, because it has 6 straight sides, it is a hexagon.

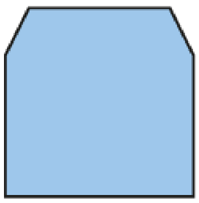


Figure 15: an irregular hexagon

Language focus
“This shape is a hexagon because it has exactly 6 straight sides.”

When discussing 3D shapes, pupils should be able to correctly use the terms ‘edges’, ‘vertex’/‘vertices’ and ‘faces’. Pupils need to be able to accurately count the number of edges, vertices and faces for simple 3D shapes, such as a triangular-based pyramid or a cuboid, using sticky paper (if necessary) to keep track of the edges/vertices/faces as they count. Pupils should be able to identify the 2D shapes that make up the faces of 3D shapes, including identifying pyramids according to the shape of their base ('square-based' and 'triangle-based').

Pupils should gain experience describing and comparing standard and non-standard exemplars of polygons. They should explore shapes (for example, shapes cut from card) rather than only looking at pictures. Examples of irregular polygons should not be restricted to those where every side-length is different and every internal angle is a different size. Examples should include polygons in which:

- *some* side-lengths are equal
- *some* internal angles are equal
- there are a variety of sizes of internal angles (acute, right angled, obtuse and/or reflex)
- there are pairs of parallel and perpendicular sides

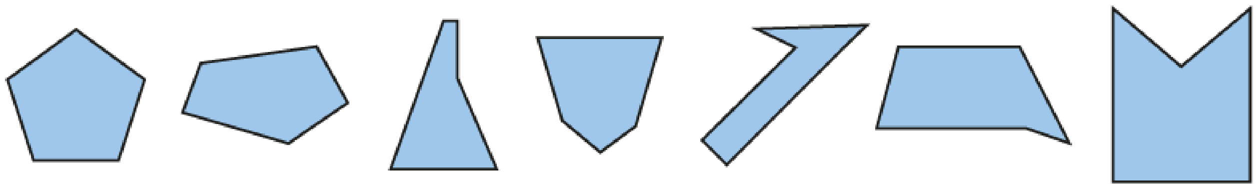


Figure 16: a variety of different pentagons (regular and irregular)

Language focus

"These shapes are all pentagons because they all have exactly 5 straight sides."

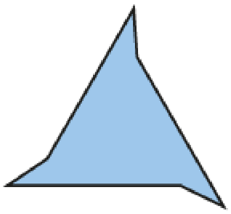
Pupils don't need to be able to identify or name angle types or parallel/perpendicular sides in year 2, but it is important that they gain visual experience of them as preparation for identifying and naming them in key stage 2.

In a similar way, pupils should gain experience describing and comparing a wide variety of 3D shapes including cuboids (and cubes), prisms, cones, pyramids, spheres and cylinders. Pupils should explore shapes practically as well as looking at pictures. Pupils should also explore and discuss regular polyhedrons such as octahedrons and dodecahedrons, although year 2 pupils do not need to remember the names of these shapes.

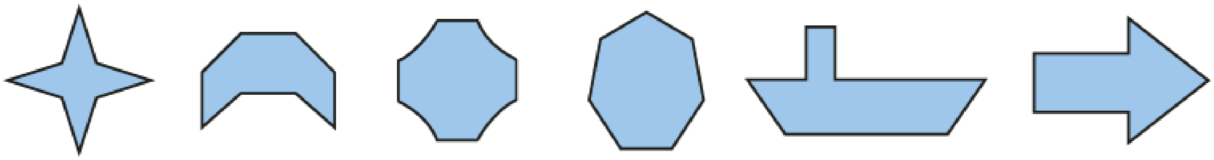
As well as discussing sides and vertices (as a precursor to evaluating perimeter and angle), pupils should begin to use informal language to discuss and compare the space inside 2D shapes (as a precursor to evaluating area). Pupils should be able to reason about the shape and size of the space inside a 2D shape, relative to other 2D shapes, using language such as 'long and thin', 'short and wide', 'larger and 'smaller'.

2G–1 Example assessment questions

1. How many sides does this shape have? What is the name of this shape?

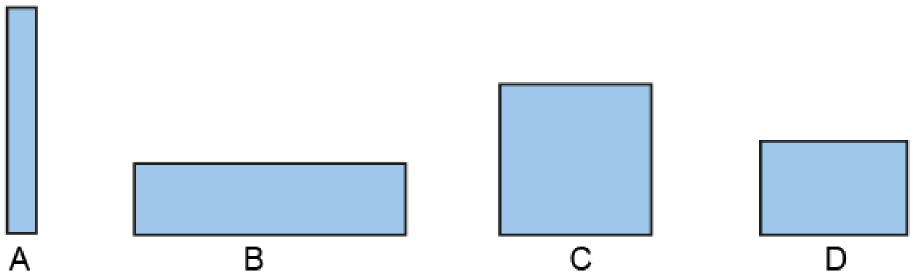


2. Sketch a hexagon. Try to think of a hexagon that will look different to those drawn by other pupils.
3. Task: Lay out a selection of 3D shapes, then instruct pupils to find a shape that has:
    a. fewer than 5 edges
    b. more than 5 faces
    c. exactly 1 vertex
    d. all faces the same shape
    e. no flat faces
    f. no straight edges
    g. both a square face and a triangular face
4.



    a. Circle all of the octagons.
    b. Explain why the shapes you have *not* circled are *not* octagons.
5. Task: Present pupils with a cylinder and a cone (the 3D shapes rather than pictures), then instruct pupils to:
    a. describe something that is the same about the 2 shapes
    b. describe something that is different about the 2 shapes
6. Task: Lay out a selection of 3D shapes, then ask pupils to identify all of the shapes that have a square face.

7. Here are 4 rectangles.

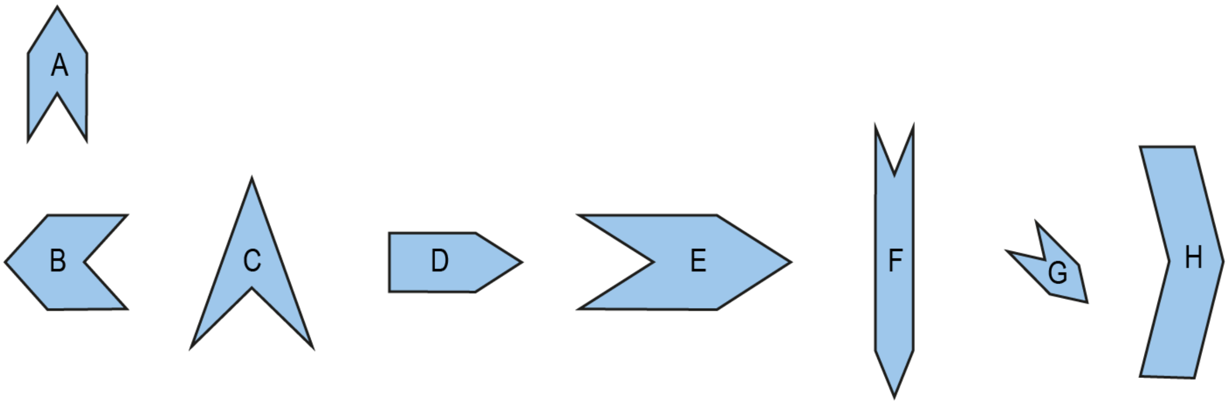


Which do you think is the largest rectangle?

Which do you think is the smallest rectangle?

If each rectangle was a slice of your favourite food, which one would you choose to have?

8. Which of the shapes B to H are exactly the same shape as shape A, but just a different size?



Assessment guidance: Practical work, carried out in small groups, should form part of the assessment of this criterion. For question 3, pupils must be able to name common 3D shapes, but do not need to be able to name every shape they might select to fulfil the required criteria. For questions 7 and 8, assessment should be discussion based – pupils need not necessarily provide a ‘correct’ answer, but should demonstrate an emerging sense of the size and shape of the space within 2D shapes. For question 8, for example, some pupils may say that shape F is the same shape as A but just stretched, and some pupils may say that F is a different shape to A because F is “long and thin” and A is “shorter and fatter”: both of these answers would show that pupils are developing awareness of the overall shape rather than just attending to the number of sides and vertices.

Calculation and fluency

2AS–1 Add and subtract across 10

Add and subtract across 10, for example:

$8+5=13$

$13-5=8$

At first, pupils will use manipulatives, such as tens frames, to understand the strategies for adding and subtracting across 10. However, they should not be using the manipulatives as a tool for finding answers. Pupils should be able to carry out these calculations mentally, using their fluency in complements to 10 and partitioning. Pupils are fluent in these calculations when they no longer rely on extensive written methods, such as equation sequences or partitioning diagrams.

Pupils do not need to memorise all additive facts for adding and subtracting across 10, but they need to be able to recall appropriate doubles (double 6, 7, 8 and 9) and corresponding halves (half of 12, 14, 16 and 18), and use these known facts for calculations such as $6+6=12$ and $18-9=9$.

Year 2 pupils will need lots of practice to be able to add and subtract across 10 with sufficient fluency to make progress with the year 3 curriculum. They should also continue to practise adding and subtracting within 10.

2AS–3 Add and subtract within 100 – part 1

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

For pupils to become fluent with the strategies for these two-digit additive calculations, as well as having automatic recall of one-digit additive facts, they must also be conceptually fluent with the connections between one-digit facts and two-digit calculations. This conceptual fluency is based on:

- being able to unitise (for example, understanding $40+50$ as 4 units of ten + 5 units of ten)
- an understanding of place-value

Pupils should be able to solve these calculations mentally and be able to demonstrate their reasoning either verbally or with manipulatives or drawings. Note that this is different from using manipulatives or drawings to calculate an answer, which pupils should not need to do.

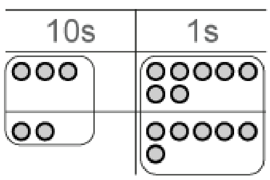
2AS–4 Add and subtract within 100 – part 2

Add and subtract within 100 by applying related one-digit addition and subtraction facts: add and subtract any 2 two-digit numbers

These calculations involve more steps than those in 2AS–3. To avoid overload of working memory, pupils should learn how to record the steps using informal written notation or equation sequences, as shown below. This is particularly important for calculations where addition of the ones involves bridging a multiple of 10, as these require a further calculation step.

26 + 37 = 63 20 6 30 7 20 + 30 = 50 6 + 7 = 13 50 + 13 = 63 **Figure 17: adding 26 and 37 by partitioning both addends**	26 + 37 = 63 30 7 26 + 30 = 56 56 + 7 = 63 **Figure 18: adding 26 and 37 by partitioning one addend**
63 − 17 = 46 10 7 63 − 10 = 53 53 − 7 = 46 **Figure 19: subtracting 17 from 63 by subtracting the tens first**	63 − 17 = 46 10 7 63 − 7 = 56 56 − 10 = 46 **Figure 20: subtracting 17 from 63 by subtracting the ones first**

Pupils do not need to learn formal written methods for addition and subtraction in year 2, but column addition and column subtraction could be used as an alternative way to record two-digit calculations at this stage. For calculations such as $26+37$, pupils can begin to think about the 2 quantities arranged in columns under place-value headings of tens and ones. They can use counters or draw dots for support:



$37 + 26 = \boxed{63}$
$30 + 20 = 50$
$7 + 6 = 13$
$50 + 13 = 63$

Figure 21: adding 2 two-digit numbers using 10s and 1s columns

2MD–1 Multiplication as repeated addition

Recognise repeated addition contexts, representing them with multiplication equations and calculating the product, within the 2, 5 and 10 multiplication tables.

Pupils must be able to carry out calculations connected to the 2, 5 and 10 multiplication tables, for example:

$4 \times 5 = \square$

Pupils should practise skip counting in multiples of 2, 5 and 10, up to 10 groups of each, until they are fluent. When carrying out a multiplication calculation by skip counting, they may keep track of the number of twos, fives or tens using their fingers or by tallying. Pupils may also recite, using the language of the multiplication tables to keep track (1 times 5 is 5, 2 times 5 is 10…). They can also use or draw 2-, 5- or 10-value counters to support them in solving multiplicative problems.

Pupils who are sufficiently fluent in year 2 multiplicative calculations are not reliant on drawing arrays or using number lines as tools to calculate. Pupils should have sufficient conceptual understanding to recognise these as models of multiplication and division, and explain how they link to calculation statements. However they should not need to use them as methods for carrying out calculations.

Pupils need to be able to represent 4 fives (or 5, 4 times) as both 4×5 and 5×4. They should be able to use commutativity to solve, for example, 2 sevens, using their knowledge of 7 twos.

2MD–2 Grouping problems: missing factors and division

Relate grouping problems where the number of groups is unknown to multiplication equations with a missing factor, and to division equations (quotitive division).

Pupils need to be able to solve missing-factor and division problems connected to the 2, 5 and 10 multiplication tables, for example:

- $\square \times 5 = 20$
- $20 \div 5 = \square$

Pupils should solve division (and missing-factor) problems, such as these, by connecting division to their emerging fluency in skip counting and known multiplication facts. Pupils should not be solving statements such as $20 \div 5$ by sharing 20 between 5 using manipulatives or by drawing dots. Pupils should also not rely on drawing arrays or number lines as tools for calculation.

As for **2MD–1**, pupils can keep track of the number of twos, fives or tens using their fingers or by tallying. They may also recite, using the language of the multiplication tables, or draw 2-, 5- or 10-value counters. Eventually pupils should be fluent in isolated multiplication facts (for example, 4 fives are 20) and use these to solve missing-factor multiplication problems and division problems.

Department for Education

National Centre for Excellence in the Teaching of Mathematics

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