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 1

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 1.

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 1 guidance

Ready-to-progress criteria

Previous experience	Year 1 ready-to-progress criteria	Future applications
Begin to develop a sense of the number system by verbally counting forward to and beyond 20, pausing at each multiple of 10.	**1NPV–1** Count within 100, forwards and backwards, starting with any number.	Count through the number system. Place value within 100. Compare and order numbers. Add and subtract within 100.
Play games that involve moving along a numbered track, and understand that larger numbers are further along the track.	**1NPV–2** Reason about the location of numbers to 20 within the linear number system, including comparing using < > and =	Reason about the location of larger numbers within the linear number system. Compare and order numbers. Read scales.
Begin to experience partitioning and combining numbers within 10.	**1NF–1** Develop fluency in addition and subtraction facts within 10.	Add and subtract across 10. 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).
Distribute items fairly, for example, put 3 marbles in each bag. Recognise when items are distributed unfairly.	**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.	Recall the 2, 5 and 10 multiplication tables. Carry out repeated addition and multiplication of 2, 5, and 10, and divide by 2, 5 and 10. Identify multiples of 2, 5 and 10. Unitise in tens. Identify odd and even numbers.

Previous experience	Year 1 ready-to-progress criteria	Future applications
Understand the cardinal value of number words, for example understanding that 'four' relates to 4 objects. Subitise for up to to 5 items. Automatically show a given number using fingers.	**1AS–1** Compose numbers to 10 from 2 parts, and partition numbers to 10 into parts, including recognising odd and even numbers.	Add and subtract within 10.
Devise and record number stories, using pictures, numbers and symbols (such as arrows).	**1AS–2** Read, write and interpret equations containing addition ($+$), subtraction ($-$) and equals ($=$) symbols, and relate additive expressions and equations to real-life contexts.	Represent composition and decomposition of numbers using equations.
See, explore and discuss models of common 2D and 3D shapes with varied dimensions and presented in different orientations (for example, triangles not always presented on their base).	**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.	Describe properties of shape. Categorise shapes. Identify similar shapes.
Select, rotate and manipulate shapes for a particular purpose, for example: • rotating a cylinder so it can be used to build a tower • rotating a puzzle piece to fit in its place	**1G–2** Compose 2D and 3D shapes from smaller shapes to match an example, including manipulating shapes to place them in particular orientations.	Find the area or volume of a compound shape by decomposing into constituent shapes. Rotate, translate and reflect 2D shapes. Identify congruent shapes.

1NPV–1 Count forwards and backwards within 100

Count within 100, forwards and backwards, starting with any number.

1NPV–1 Teaching guidance

Counting to and across 100, forwards and backwards, is a skill that will need to be practised regularly throughout year 1.
Counting provides a good opportunity to link number names to numerals, and to the position of numbers in the linear number system. Practice should include:

- reciting number names, without the support of visual representations, to allow pupils to focus on and develop fluency in the verbal patterns
- counting with the support of visual representations and gestural patterns, for example pupils can point to numerals on a 100 square or number line, or tap out the numbers on a Gattegno chart
- starting the counting sequence with numbers other than 1 or 100

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Figure 1: 100 square

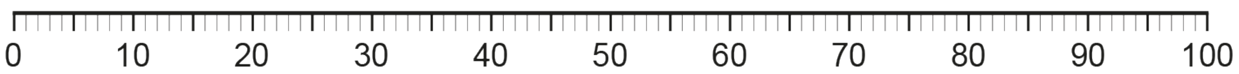


Figure 2: 0 to 100 number line

1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000
100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9

Figure 3: Gattegno chart showing multiples of 1, 10, 100 and 1,000

It is important to draw pupils' attention to structures in the number system, for example, linking 1, 2, 3, 4, 5… to 31, 32, 33, 34, 35…, and this can be supported by the use of the visual representations above.

Because number names in English do not always reflect the structure of the numbers, pupils should also practise using dual counting, first counting with number names, and then repeating the count with words based on the number structures.

Language focus

"…seven, eight, nine, ten, eleven, twelve, thirteen… twenty, twenty-one, twenty-two…"

"…seven, eight, nine, one-ten, one-ten-one, one-ten-two, one-ten-three… two-tens, two-tens-one, two-tens two…"

When counting backwards, pupils often find it challenging to identify which number they should say after they have said a multiple of 10. A partially marked number line can be used for support.

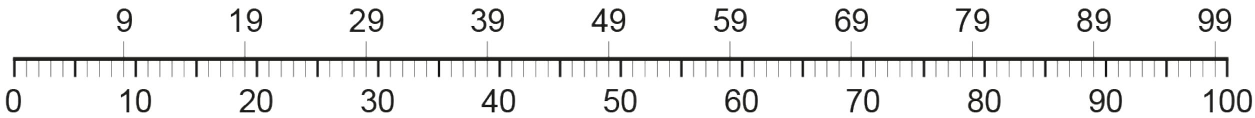


Figure 4: 0 to 100 number line to support backwards counting

Counting backwards from 20 down to 10 requires additional focused practice, due to the irregularity of these number names. By the end of year 1, pupils must be able to count forwards and backwards, within 100, without visual aids.

Making connections

Being able to count fluently, both forwards and backwards, is necessary for pupils to be able to reason about the location of numbers in the linear number system (**1NPV–2**) Sequencing in ones will extend to sequencing in multiples of 2, 5 and 10 (**1NF–2**).

1NPV–1 Example assessment questions

1. Fill in the missing numbers.

	8	9		11	12

37	38		40		42	43

63	62		60		58	57

Assessment guidance: To assess criterion **1NPV–1**, teachers must listen to each pupil count. This can be done through specifically planned tasks, or by carefully watching and listening to an individual pupil during daily counting as part of class routines.

1NPV–2 Numbers to 20 in the linear number system

Reason about the location of numbers to 20 within the linear number system, including comparing using < > and =

1NPV–2 Teaching guidance

Pupils should be introduced to the number line as a representation of the order and relative size of numbers.
Pupils should:

- begin to develop the ability to mentally visualise a number line, with consecutive whole numbers equally spaced along it
- draw number lines, with consecutive whole numbers equally spaced along them
- identify or place numbers up to 20 on marked and unmarked number lines

Pupils should use efficient strategies and appropriate reasoning, including working backwards from a multiple of 10, to identify or place numbers on marked number lines.

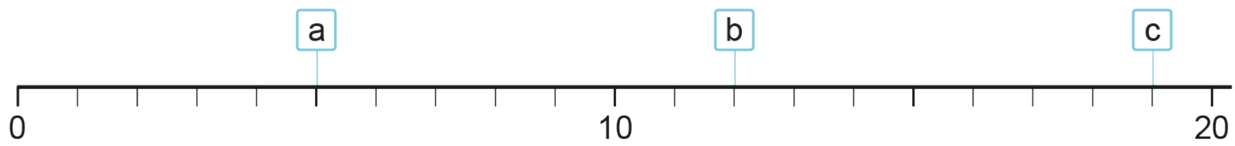


Figure 5: identifying 5, 12 and 19 on a marked 0 to 20 number line

> **Language focus**
>
> "*a* is 5 because it is halfway between 0 and 10."
>
> "*b* is 12 because it is 2 more than 10."
>
> "*c* is 19 because it is one less than 20."

Pupils should also be able to estimate the value or position of numbers on unmarked number lines, using appropriate proportional reasoning, rather than counting on from a start point or back from an end point. Pupils should learn to estimate the value/position of a number relative to both ends of the number line, beginning with a 0 to 10 number line, then moving on to 0 to 20 and 10 to 20 number lines. When pupils are asked to mark all numbers on, for example, an unmarked 0 to 10 number line, they typically start at 1 and run out of space as they approach 10, and so bunch the larger numbers together. Pupils should learn to look at the full length of the number line and mark on the midpoint first. They should be able to reason about the location of numbers relative to both ends, and the midpoint, of a number line, for example, "16 is about here because it is just over halfway between 10 and 20."

Figure 6: placing 16 on an unmarked 0 to 20 number line

There is no need for pupils to be completely accurate in their estimation of value or position of numbers. Rather they should make reasonable judgements that demonstrate they are developing proportional thinking.

Pupils should use their knowledge of the position of the numbers 0 to 10 on a number line to help them to estimate the value or position of the numbers 10 to 20.

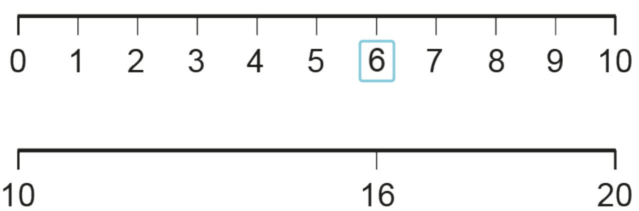


Figure 7: placing 16 on an unmarked 10 to 20 number line

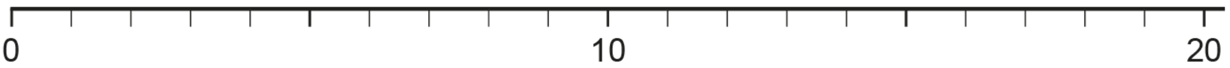
Making connections

Being able to count fluently (1NPV–1), both forwards and backwards, is necessary for pupils to be able to reason about the location of numbers in the linear number system.

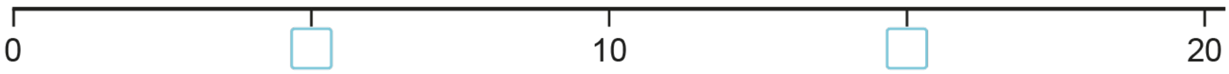
1NPV–2 Example assessment questions

1. Label these numbers on the number line.

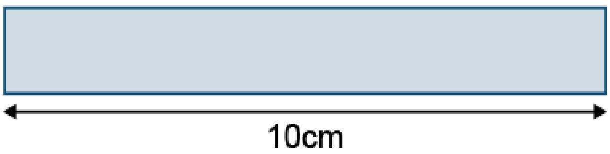
9 15 3 12



2. Estimate the value of the missing numbers.

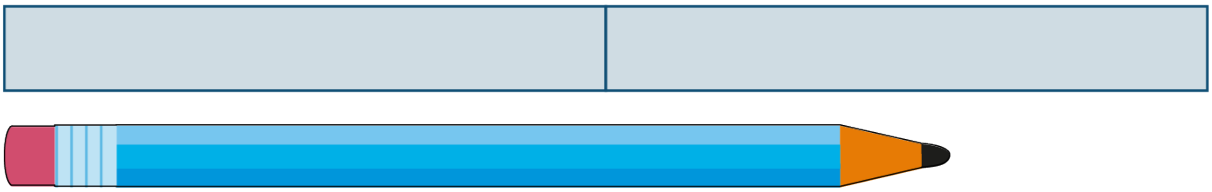


3. Mahmood is using 10cm paper strips to measure things in the classroom.



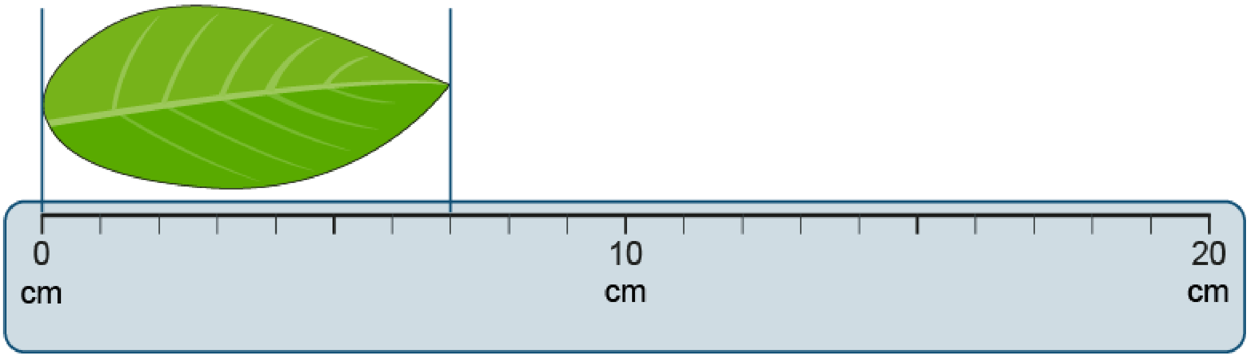
   a. How long do you think the eraser is?

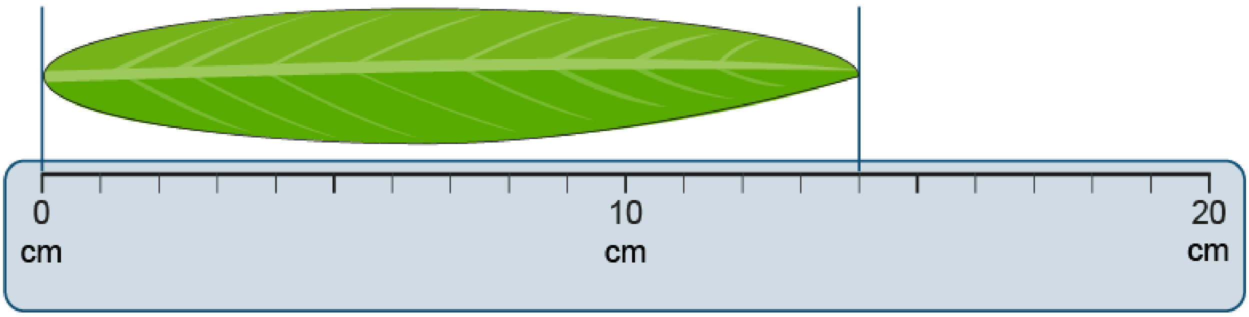
b. How long do you think the pencil is?



Images drawn to scale

4. Mia measures 2 different leaves with a ruler. How long is each leaf?





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Assessment guidance: The example questions above can be set as a written task. However, teachers will need to watch pupils closely to assess wheher pupils are developing efficient strategies and appropriate proportional reasoning skills. Teachers should assess pupils in small groups.

1NF–1 Fluently add and subtract within 10

Develop fluency in addition and subtraction facts within 10.

1NF–1 Teaching guidance

It is very important for pupils to be able to add and subtract within 10, fluently, by the end of year 1. This should be taught and practised until pupils move beyond counting forwards or backwards in ones, to more efficient strategies and eventually to automatic recall of these number facts. This is necessary before pupils move on to additive calculation with larger numbers.

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										

Pupils should learn to compose and partition numbers within 10 (1AS–1) before moving on to formal addition and subtraction. Although **1NF–1** (this criteiron) and 1AS–2 are presented as separate ready-to-progress criteria, they depend upon one another and should be developed, in tandem, throughout year 1.

As part of their work on **1AS–1**, pupils are likely to already have memorised some number bonds within 10 (for example, number bonds to 5, to 10 and some doubles facts). However, at this stage, most pupils won't remember all of their number facts by rote learning, so they should also be taught to derive additive facts within 10 from previously memorised facts or knowledge. Examples of appropriate strategies include the following.

Example strategy 1:

> **Language focus**
>
> "I know that double 3 is equal to 6, so 4 plus 3 is equal to 7."

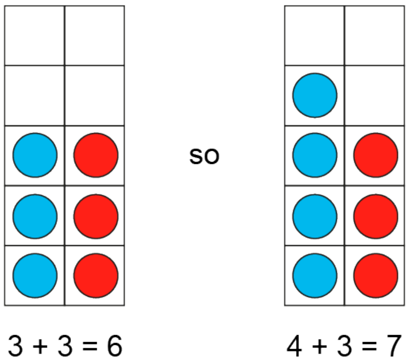


Figure 8: tens frames with counters showing derivation of a 'near-double' addition calculation

Example strategy 2:

> **Language focus**
>
> "If I subtract 2 from an even number I get the previous even number, so 6 minus 2 is equal to 4."

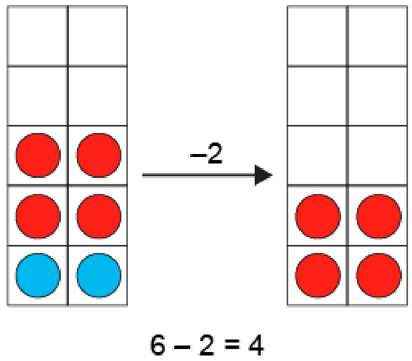


Figure 9: tens frames with counters showing that subtracting 2 from an even number gives the previous even number

Pupils need extensive practice to meet this criterion. You can find out more about fluency for addition and subtraction within 10 here in the calculation and fluency section: **1NF–1**

> **Making connections**
>
> Understanding how numbers within 10 can be composed and partitioned (**1AS–1**) underpins fluency in addition and subtraction facts within 10.
>
> Pupils need to be able carry out these calculations when they are presented as equations, and when they are presented as contextual word problems as described in **1AS–2**. The **1NF–1 Example assessment questions** below provide contextual problems only.

1NF–1 Example assessment questions

1. I cycled 4km to get to my friend's house, and then cycled another 3km with my friend. How far have I cycled?
2. There are 9 children. 6 of them have scooters and the rest do not. How many of the children do not have scooters?
3. Sarah had £6. Then she spent £3. How much money does she have left?
4. I have 1 metre of red ribbon. I have 5 metres of blue ribbon. How many metres of ribbon do I have altogether?

1NF–2 Count forwards and backwards in multiples of 2, 5 and 10

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.

1NF–2 Teaching guidance

Pupils must be able to count in multiples of 2, 5 and 10 by the end of year 1 so that they are ready to progress to multiplication involving groups of 2, 5 and 10 in year 2. As with counting in ones, within 100 (**1NPV–1**), this is a skill that will need to be practised throughout year 1.

As with **1NPV–1**, forwards and backwards counting practice should include:

- reciting just the number names (for example, "ten, twenty, thirty…"), without the support of visual representations
- counting with the support of visual representations and gestural patterns, for example pupils can point to numerals on a number line or 100 square, or tap out the numbers on a Gattegno chart
- starting the forwards counting sequence with numbers other than 2, 5 or 10

The 100 square and Gattegno chart are provided in criterion **1NPV–1** in figures 1 and 3 respectively.

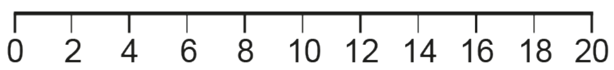


Figure 10: number line to support counting in multiples of 2

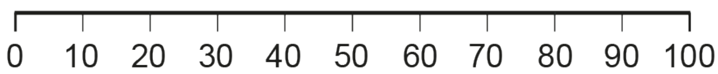


Figure 11: number line to support counting in multiples of 10

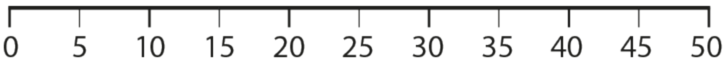


Figure 12: number line to support counting in multiples of 5

When pupils are confident with the counting sequences, they should learn to enumerate objects arranged in groups of 2, 5 or 10 by skip counting, so they begin to connect counting in multiples with finding the total quantity for repeated groups. Pupils should first identify how many objects are in each repeated group, and then skip count in this number. They should leave year 1 understanding that when objects are grouped equally, it is more efficient to skip count than to count in ones. Recognising that a group of 5, for example, can be treated as a single unit is called unitising, and is the basis of multiplicative reasoning.

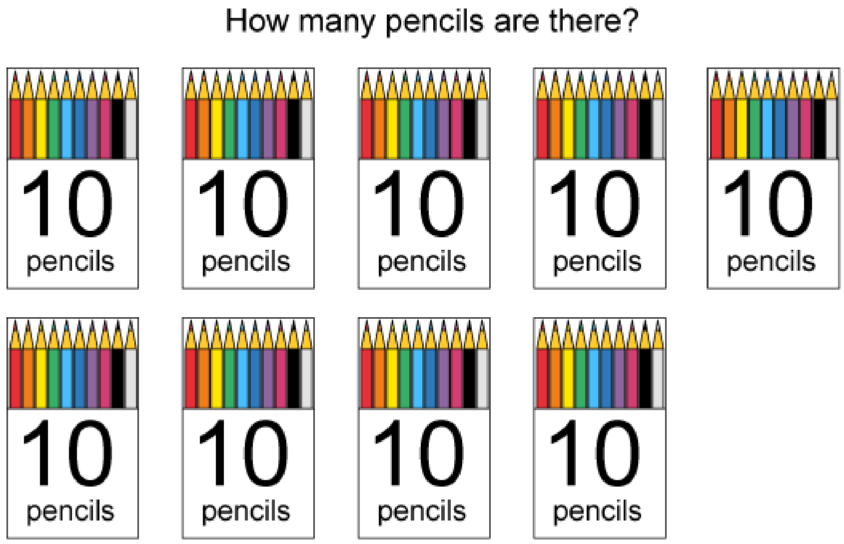


Figure 13: counting in tens – 9 packs of 10 pencils

Language focus

"The pencils are in groups of 10, so we will count in tens."

Pupils should also practise counting in two ways: counting the total number of objects using skip counting, or counting the number of repeated groups. This will prepare pupils for multiplication and division in year 2.

Language focus

"Ten, twenty, thirty…"

"1 group of 10, 2 groups of 10, 3 groups of 10…"
In time, shortened to:
"1 ten, 2 tens, 3 tens…"

Once pupils have learnt to recognise 2p, 5p and 10p coins, they should be expected to apply their knowledge of counting in multiples of 2, 5 and 10 to find the value of a set of like coins, and to find how many of a particular denomination is required to pay for a given item – see **1NF–2** (questions 6 and 7).

Pupils should also learn to recite the odd number sequence, both forwards and backwards. This can initially be supported by a number line with odd numbers highlighted.

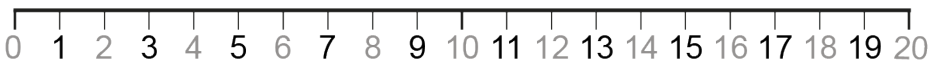


Figure 14: number line to support counting through the odd number sequence

Pupils need extensive practice to meet this criterion. You can find out more about fluency for counting in multiples of 2, 5 and 10 here in the calculation and fluency section: **1NF–2**

Making connections

The patterns and structure in the number system which pupils learn from counting in ones (**1NPV–1**) will prepare pupils for learning to count in multiples of 2, 5 and 10.

In **1AS–1** pupils learn to identify odd and even numbers within 10. Counting in multiples of 2 (even numbers), and through the odd number sequence, demonstrates to pupils that the odd and even number patterns continue through the number system.

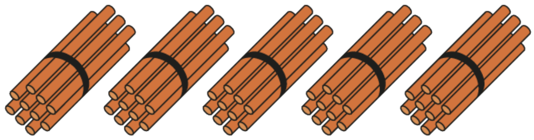
1NF–2 Example assessment questions

1. Task: Provide each pupil with an even number of counters up to 20, then ask pupils to:

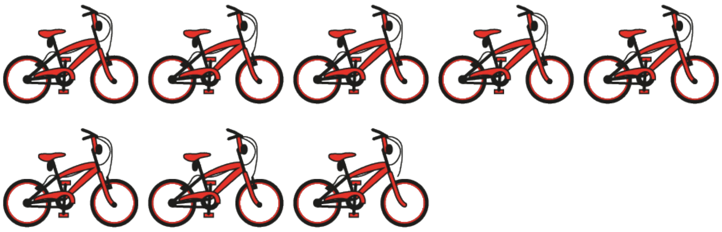
    a. put the counters into groups of 2

    b. count in multiples of 2 find out how many counters there are

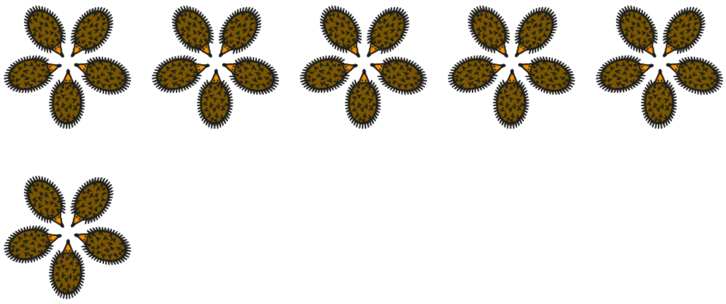
2. These sticks are grouped into bundles of 10. How many sticks are there altogether?



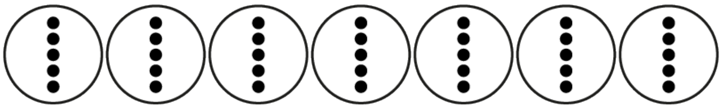
3. How many wheels are there altogether? Count in groups of 2.



4. There are 5 hedgehogs in each group. How many hedgehogs are there altogether?

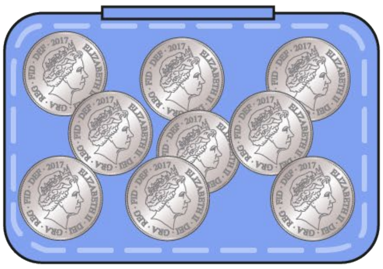


5. There are 5 dots on each token. How many dots are there altogether?

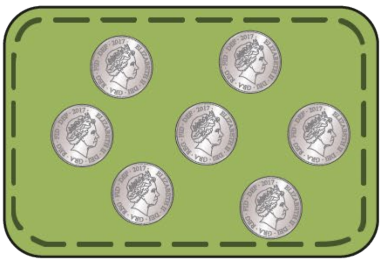


6. How much money is in each purse?

2p coins

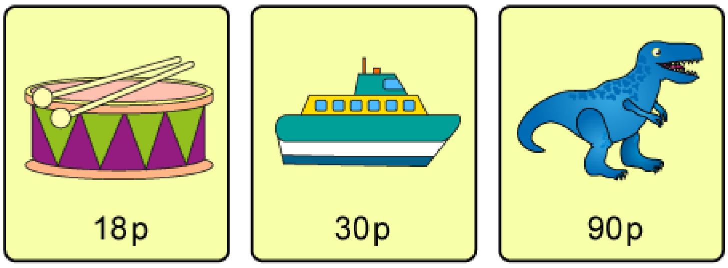


10p coins



5p coins

7. Task: Provide each pupil with 2p, 5p and 10p coins (real or otherwise), then ask pupils to show how to pay for:
   a. the drum with 2p coins
   b. the boat with 5p coins
   c. the dinosaur with 10p coins



Assessment guidance: To assess whether pupils can recite the number sequences, teachers must listen to each pupil count. This can be done through specifically planned tasks, or by carefully watching and listening to an individual pupil during daily counting as part of class routines.

The example questions and tasks above can be used to assess whether pupils can enumerate objects in groups of 2, 5 or 10. However, simply providing the correct answers to the example questions does not demonstrate that a pupil has met this part of the criterion – teachers should assess pupils in small groups to ensure that they are counting in multiples of 2, 5 or 10 rather than in ones.

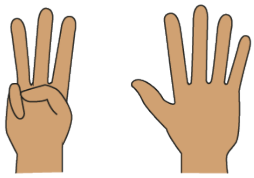
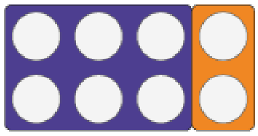
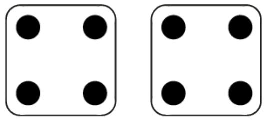
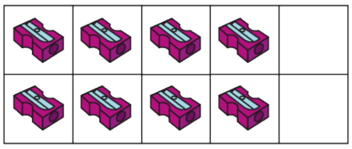
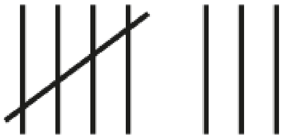
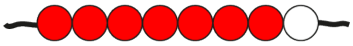
1AS–1 Compose and partition numbers to 10

Compose numbers to 10 from 2 parts, and partition numbers to 10 into parts, including recognising odd and even numbers.

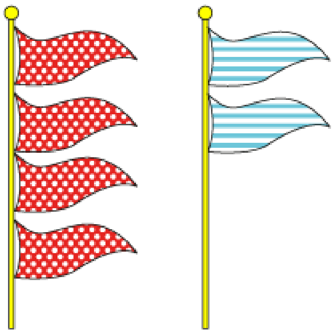
1AS–1 Teaching guidance

Learning to ‘see’ a whole number and the parts within it at the same time is an important stage in the development of pupils’ understanding of number. Composing numbers (putting parts together to make a whole) underpins addition, and decomposing a number into parts (partitioning) underpins subtraction. Exploring different ways that a number can be partitioned and put back together again helps pupils to understand that addition and subtraction are inverse operations.

Pupils should be presented with varied cardinal (quantity) representations, both concrete and pictorial, which support identification of the ‘numbers within a number’. The examples below provide different ways of showing that 8 can be composed from 2 numbers. The representations draw attention to the parts within the whole.

 Figure 15: 8 represented as 3 fingers and 5 fingers	 Figure 16: 8 represented as 6 and 2 with base 10 number boards	 Figure 17: 8 represented as two 4-value dice
 Figure 18: 8 represented as 2 rows of 4	 Figure 19: 8 represented as tally marks: 5 and 3	 Figure 20: 8 represented on a bead string: 7 and 1

Pupils should learn to interpret and sketch partitioning diagrams to represent the ways numbers can be partitioned or combined. At this stage, these should be used alongside quantity images to support development of the understanding of quantity. Pupils should be able to relate the numerals in the partitioning diagrams to the quantities in images, and use the language of parts and wholes to describe the relationship between the numbers.



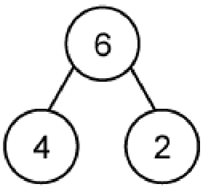


Figure 21: using a partitioning diagram to represent 6 flags, consisting of 4 spotty flags and 2 stripy flags

Language focus

"There are 6 flags. 4 are spotty and 2 are stripy."

"6 is the whole. 4 is a part. 2 is a part."

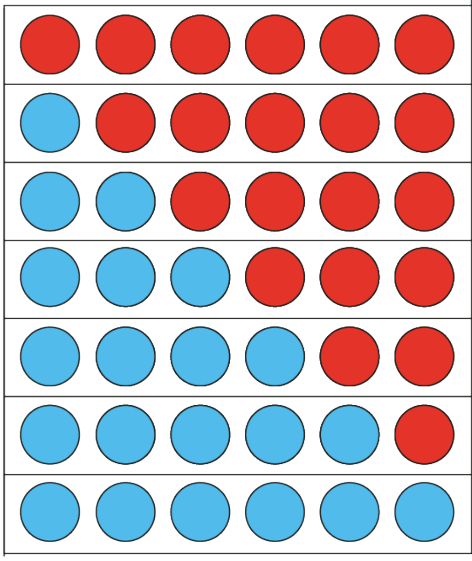
Pupils should also experience working with manipulatives and practise partitioning a whole number of items into parts, then putting the parts back together. They should understand that the total quantity is conserved. Pupils should repeatedly partition and recombine the whole, in different ways.

Pupils should learn how to work systematically to partition each of the numbers to 10 into 2 parts. They should recognise that there is a finite number of ways that a given number can be partitioned.

Pupils should pay attention to the patterns observed when working systematically, for example:

- in each step below, the value of one part increases by 1 and the value of the other part decreases by 1, while the whole remains the same
- number pairs are repeated, but with the values reversed, for example when 6 is the whole, the parts can be 2 and 4, or 4 and 2 (pupils must be able to identify what is the same and what is different between these two options; this lays the foundations for understanding the commutative property of addition)

Pupils must be able to describe and understand these patterns.



Blue	Red
0	6
1	5
2	4
3	3
4	2
5	1
6	0

Figure 22: working systematically to partition 6

Once pupils have learnt to write addition and subtraction equations, they should use these to express the different ways that numbers can be composed and decomposed (see **1AS–2**), for example:

$6 = 2 + 4$ $\quad$ $6 = 4 + 2$ $\quad$ $6 - 4 = 2$ $\quad$ $6 - 2 = 4$

Pupils should learn to recognise odd and even numbers, up to 10, based on whether they can be composed of groups of 2 or not. Base 10 number boards, or tens frames with counters shown arranged in twos, can be used to expose the structure of odd and even numbers.

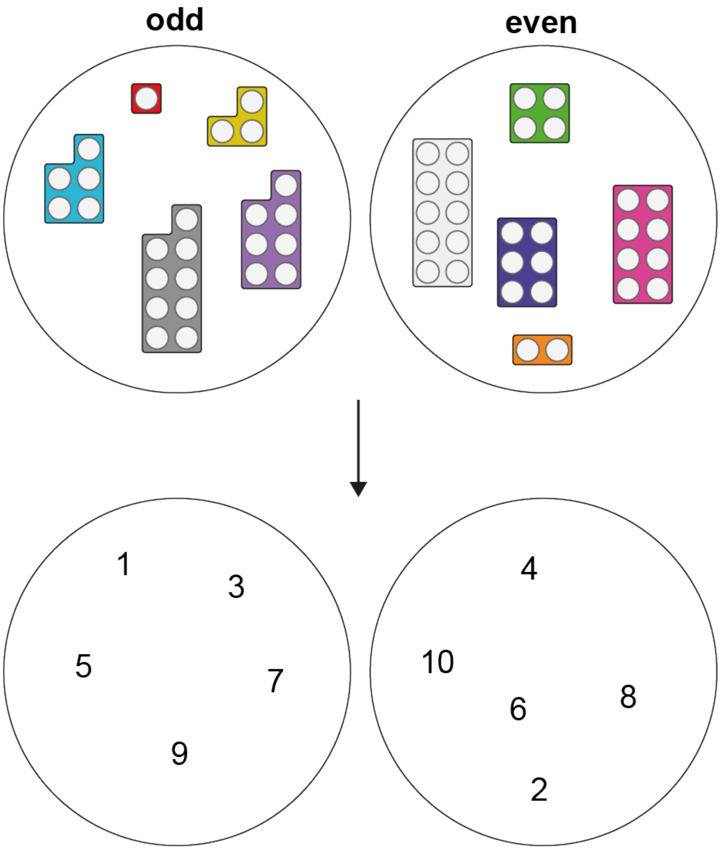


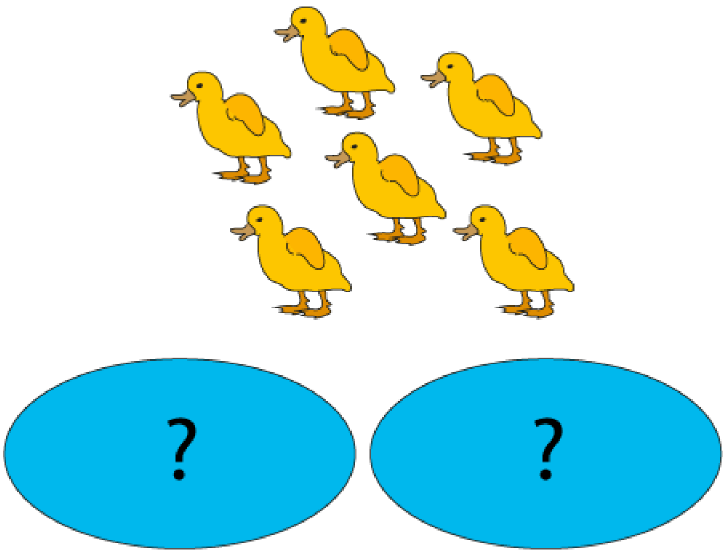
Figure 23: odd and even numbers up to 10

Making connections

Composing and decomposing numbers within 10 can be expressed with addition and subtraction equations (1AS–2), and is the basis of fluency in addition and subtraction facts within 10 (1NF–1). Here, pupils learn to identify odd and even numbers, while in 1NF–2 they develop fluency in the odd and even number sequences through practising skip counting.

1AS–1 Example assessment questions

1. Mother duck is in the water with her 6 ducklings. There are 2 ponds. How many ducklings could be in each pond?



2. Fill in the missing numbers.

a.

$5 = 5 + 0$

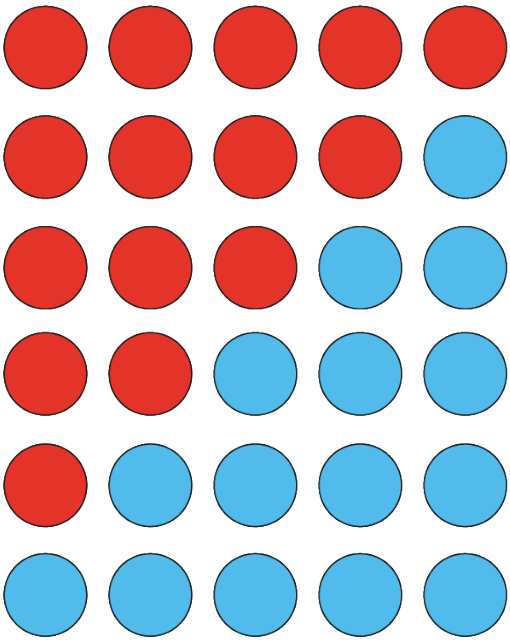
$5 = 4 + \square$

$5 = 3 + \square$

$5 = 2 + \square$

$5 = 1 + \square$

$5 = 0 + \square$



b.

$7 + \square = 7$

$6 + \square = 7$

$5 + \square = 7$

$4 + \square = 7$

$3 + \square = 7$

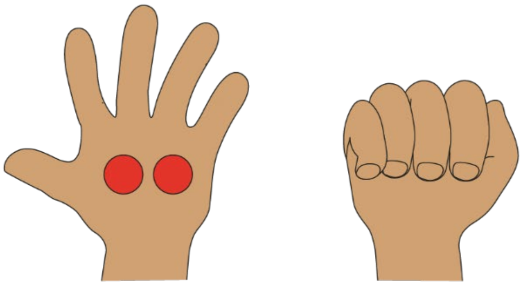
$2 + \square = 7$

$1 + \square = 7$

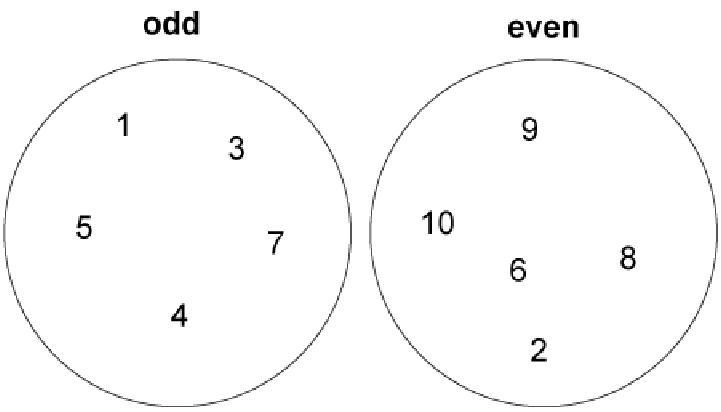
$0 + \square = 7$

3. Task: Provide each pupil with a tens frame and counters in 2 colours, then ask pupils to use the manipulatives to answer questions such as the following.

   "I am holding 9 counters altogether. How many counters are there in my closed hand?"



4. Underline the numbers that are in the wrong sorting circle.



5. Write the missing numbers in these odd and even sequences.

1	**3**			**9**

2		**6**		**10**

Assessment guidance: The focus of this criterion is understanding that numbers can be composed from, and partitioned into, smaller numbers. Pupils are assessed separately on their fluency in number facts within 10, in criterion **1NF–1**. Therefore manipulatives such as counters and tens frames, or counters and partitioning diagram templates, should be made available to pupils during assessment of this criterion so that the questions are not dependent on pupils' emerging number facts fluency.

Note that Example assessment question 2 relies on pupils having learnt to write and interpret addition and subtractions equations. This question should only be used to assess understanding of composition and partitioning after pupils have met criterion **1AS–2**.

1AS–2 Read, write and interpret additive equations

Read, write and interpret equations containing addition ($+$), subtraction ($-$) and equals ($=$) symbols, and relate additive expressions and equations to real-life contexts.

1AS–2 Teaching guidance

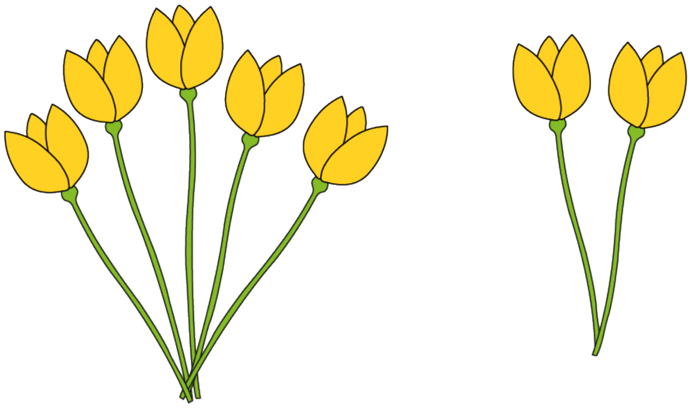
Pupils must learn to use the mathematical symbols $+$, $-$ and $=$. Expressions or equations involving these symbols should be introduced as a way to represent numerical situations and mathematical stories. An expression such as $3+5$ should not be interpreted as asking "What is $3+5$?" but, rather, as a way to represent the additive structures discussed below, either within a real-life context or within an abstract numerical situation. It is important that pupils do not think of the equals symbol as meaning 'and the answer is'. They should instead understand that the expressions on each side of an equals symbol have the same value. All examples used to teach this criterion should use quantities within 10, and be supported by manipulatives or images, to ensure that pupils are able to focus on the mathematical structures and to avoid the cognitive load of having to work out the solutions.

For each of the 4 additive structures described below (aggregation, partitioning, augmentation and reduction), pupils should learn to link expressions (for example, $5+2$ and $6-2$) to contexts before they learn to link equations (for example, $5+2=7$ and $6-2=4$) to contexts. For each case, pupils' understanding should be built up in steps:

1. Pupils should first learn to describe the context using precise language (see the language focus boxes below).
2. Pupils should then learn to write the associated expression or equation.
3. Pupils should then use precise language to describe what each number in the expression or equation represents.

Pupils need to be able to write and interpret expressions and equations to represent aggregation (combining 2 parts to make 1 whole) and partitioning (separating 1 whole into 2 parts).

How many flowers are there altogether?



5 + 2 = 7

Figure 24: addition as aggregation

Language focus

"There are 5 flowers in one bunch. There are 2 flowers in the other bunch. There are 7 flowers altogether."

"We can write this as 5 plus 2 is equal to 7."

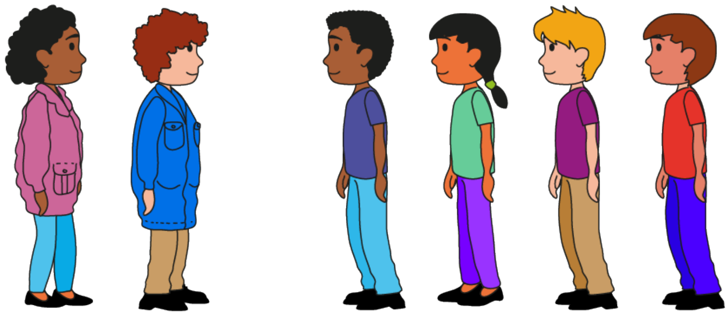
"The 5 represents the number of flowers in 1 bunch."

"The 2 represents the number of flowers in the other bunch."

"The 7 represents the total number of flowers."

Pupils must understand that, in partitioning situations, the subtraction symbol represents a splitting up or differentiating of the whole. The problem "There are 6 children altogether. 2 children are wearing coats. How many are not wearing coats?" is represented by $6-2=4$. Here, the subtraction symbol represents the separation of the 2 children wearing coats, and so, the number of children not wearing coats is exposed.

How many children are not wearing coats?



6 – 2 = 4

Figure 25: subtraction as partitioning

Language focus

"There are 6 children altogether. 2 children are wearing coats. 4 children are not wearing coats."

"We can write this as 6 minus 2 is equal to 4."

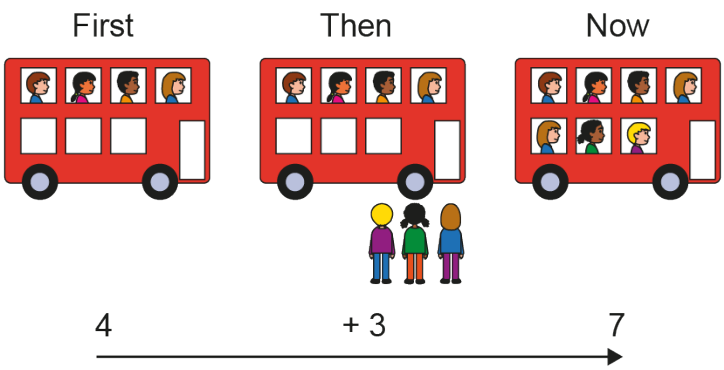
"The 6 represents the total number of children."

"The 2 represents the number of children that are wearing coats."

"The 4 represents the number of children that are not wearing coats."

Pupils must also be able to write and interpret expressions and equations to represent **augmentation** (increasing a quantity by adding more) and **reduction** (decreasing a quantity by taking some away). Note that 'take away' should only be used to describe the subtraction operation in reduction contexts.

How many children are on the bus now?



4 + 3 = 7

Figure 26: addition as augmentation

Language focus

"First 4 children were sitting on the bus. Then 3 more children got on the bus. Now 7 children are sitting on the bus."

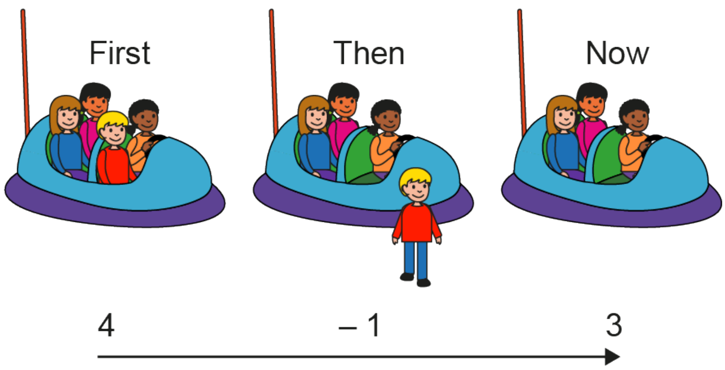
"We can write this as 4 plus 3 is equal to 7."

"The 4 represents the number of children that were on the bus at the start."

"The 3 represents the number of children that got on the bus."

"The 7 represents the number of children that are on the bus now."

How many children are in the bumper car now?



4 – 1 = 3

Figure 27: subtraction as reduction

Language focus

"First there were 4 children in the bumper car. Then 1 child got out. Now there are 3 children in the bumper car."

"We can write this as 4 minus 1 is equal to 3."

"The 4 represents the number of children that were in the car at the start."

"The 1 represents the number of children that got out of the car."

"The 3 represents the number of children that are in the car now."

In the course of learning to read, write and interpret addition and subtractions equations, pupils should also learn that equations can be written in different ways, including:

- varying the position of the equals symbol (for example, $5-2=3$ and $3=5-2$)
- for addition, the addends can be written in either order and the sum remains the same (commutativity)

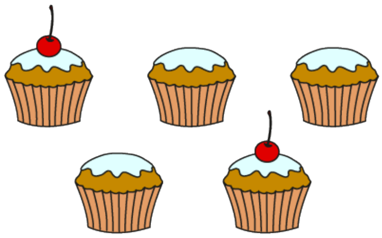


Figure 28: aggregation or partitioning context: 5 cakes altogether, 2 with cherries and 3 without

$2+3=5$

$5=2+3$

$3+2=5$

$5=3+2$

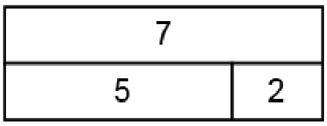
$5-3=2$

$2=5-3$

$5-2=3$

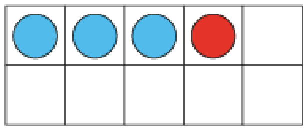
$3=5-2$

Pupils must also learn to relate addition and subtraction contexts and equations to mathematical diagrams such as bar models, number lines, tens frames with counters, and partitioning diagrams.



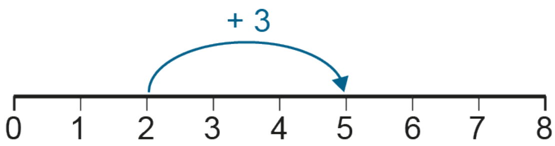
7 – 2 = 5

Figure 29: bar model and subtraction equation ($7-2=5$)



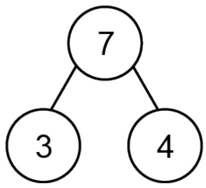
3 + 1 = 4

Figure 31: tens frame with counters and addition equation ($3+1=4$)



2 + 3 = 5

Figure 30: number line and addition equation ($2+3=5$)



7 – 3 = 4

Figure 32: cherry partitioning model and subtraction equation ($7-3=4$)

Making connections

Once pupils have completed this criterion, they should represent the composition and partitioning of numbers to 10 (1AS–1) using addition and subtraction equations.

This criterion and **1AS–1** provide the conceptual prerequisites for pupils to develop fluency in addition and subtraction within 10 (1NF–1).

1AS–2 Example assessment questions

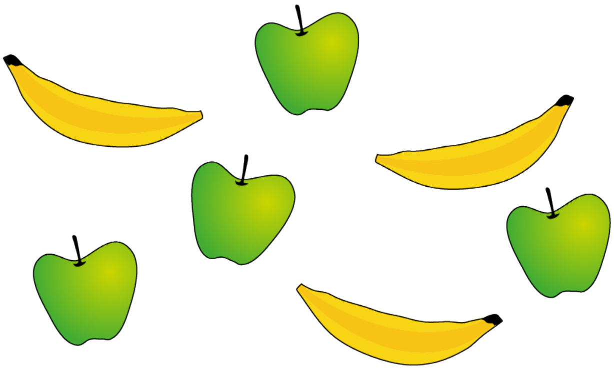
1. Write an equation to represent this story.

   First I had 6 balloons. Then 2 floated away. Now I have 4 balloons.

2. Write an equation to represent this story.

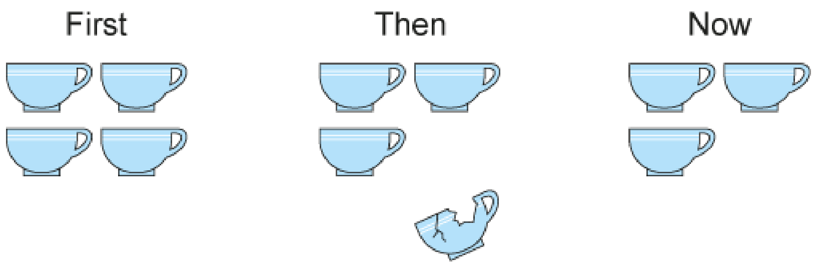
   There are 2 apples. There are 3 oranges. Altogether there are 5 pieces of fruit.

3. Which equation matches the picture? Can you explain your choice?



3 + 3 = 6	8 = 4 + 3	4 = 3 + 1	4 + 3 = 7

4. Holly looks at this picture. She writes $4 - 1 = 3$. Explain how Holly's equation represents the picture.



5. Write an equation to represent this picture. Explain how your equation matches the picture.

Assessment guidance: For pupils to meet this criterion, they need to demonstrate mastery of the structures. Correct calculation of the solutions to calculations is not required (this is assessed in **1NF–1**).

Where a question requires pupils to explain their reasoning, this should be done verbally.

1G–1 Recognise common 2D and 3D shapes

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.

1G–1 Teaching guidance

Pupils need a lot of experience in exploring and discussing common 2D and 3D shapes. In the process, they should learn to recognise and name, at a minimum:

- rectangles (including squares), circles, and triangles
- cuboids (including cubes), cylinders, spheres and pyramids

Pupils need to be able to recognise common shapes when they are presented in a variety of orientations and sizes and relative proportions, including large shapes outside the classroom (such as a rectangle marked on the playground or a circle on a netball court). Pupils should be able to describe, using informal language (for example, “long and thin”), the differences between non-similar examples of the same shapes, and recognise that these are still examples of the given shape.

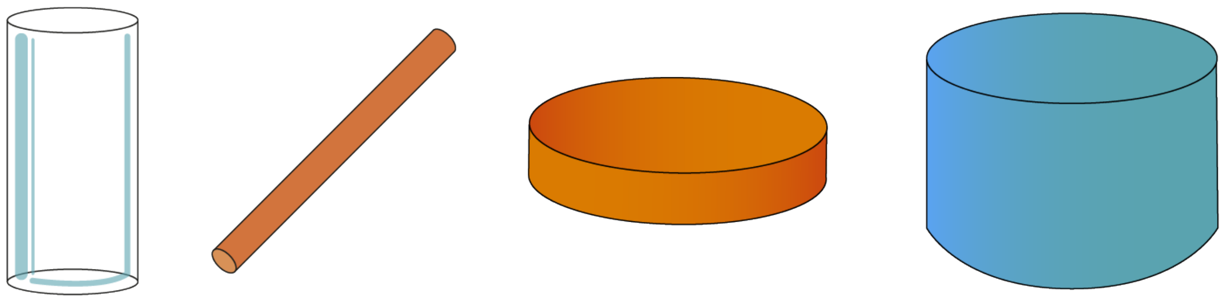


Figure 33: non-similar cylinders

Pupils should practise distinguishing a given named shape type from plausible distractors. These activities should involve exploring shapes (for example, shapes cut from card) rather than only looking at pictures.

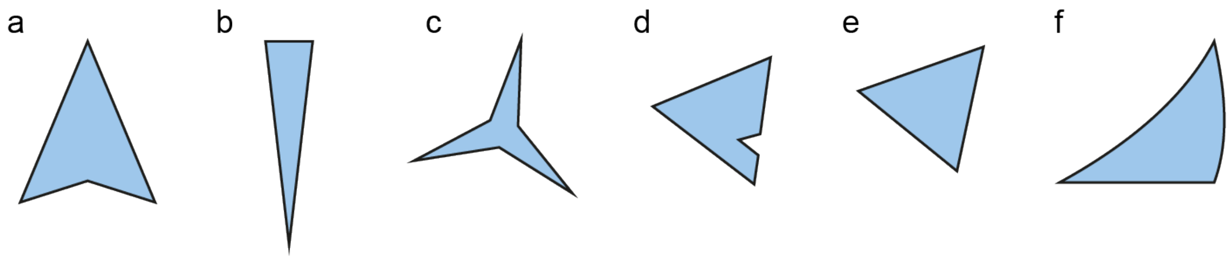


Figure 34: distinguishing triangles from plausible distractors

Language focus

Shape a: “This is not a triangle because it has 4 sides.”

Shape b or e: “This is a triangle because it has 3 straight sides.”

Shape c or d: “This is not a triangle because it has 6 sides.”

Shape f: “This is not a triangle because some sides are curved.”

Making connections

Categorising examples and non-examples (for example, determining which shapes are triangles and which are not) is an important mathematical skill. Pupils should be developing this skill here and in other contexts, such as in **1AS–1**, where they categorise numbers according to whether they are even or not even.

1G–1 Example assessment questions

1. Task: Lay out a selection of 3D shapes, then ask “Can you find 3 different cuboids?”
2. Task: Lay out a selection of 2D shapes that include triangles and plausible distractors, and other 2D shapes, then instruct pupils to choose 3 shapes as follows:
   - a triangle
   - a shape that reminds you of a triangle but is not one
   - a shape which is nothing like a triangle
3. Task: Lay out a selection of shapes, hold up one of them, and ask:
   - “I wonder whether this shape is a rectangle. What do you think?”
   - “Can you find a shape which is a rectangle?” (if the original shape is not a rectangle)

4. Task: Lay out a selection of shapes, hold up a cylinder, and instruct pupils to find another shape which “ is a bit like this one”. Ask pupils to explain their reasoning.

Assessment guidance: Practical work, carried out in small groups, provides the most reliable method of assessing whether pupils have met this criterion. Teachers should assess pupils based, not just on their answers, but on the reasoning they use to reach their answers, for example, in question 4, a pupil may choose a cone because “it has a circle too”. When selecting shapes, careful attention should be paid to providing plausible distractors to allow assessment of reasoning. Pupils may use informal language, especially when discussing plausible distractors, for example, the shape presented in question 3 could be a parallelogram, which pupils could describe as being “a bit like a rectangle, but squashed.” Ask pupils to explain why they chose that one.

1G–2 Compose 2D and 3D shapes from smaller shapes

Compose 2D and 3D shapes from smaller shapes to match an example, including manipulating shapes to place them in particular orientations.

1G–2 Teaching guidance

The ability to compose and decompose shapes, and see shapes within shape, is a skill which runs through to key stage 3 and key stage 4, and beyond. In year 1, it is vital that pupils work practically, exploring shapes (for example, shapes cut from card, pattern blocks and tangrams) and putting them together to make new shapes.

Pupils must be able to arrange 2D shapes to match an example compound shape. To begin with, the constituent shapes in a given example image should be the same size and colour as the actual shapes that pupils are using. This allows pupils to begin by laying the pieces over the example image, rotating individual pieces to match the exemplars. By the end of year 1, though, pupils should be able to copy a pattern block picture, and make a good attempt at copying a tangram picture, without overlaying the pieces on the example.

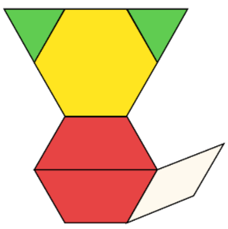


Figure 35: example pattern block picture

Figure 36: example tangram picture

Tangrams are more challenging to complete than pattern block pictures because:

- they contain several different-sized triangles, which pupils must distinguish from one another to complete the task
- placement of the parallelogram may require pupils to turn it over rather than just rotate it

Pupils must also be able to arrange 3D shapes to match an example compound shape, for example joining a given number of multilink blocks to match an example. As a first step pupils can each make their own shape from a given number of blocks, and then compare the different shapes that have been made. Comparing compound shapes, and identifying the ones that are the same, will require pupils to rotate the shapes in various directions, and provides an opportunity to develop spatial language including: left, right, top, middle, bottom, on top of, below, in front of, behind and between.

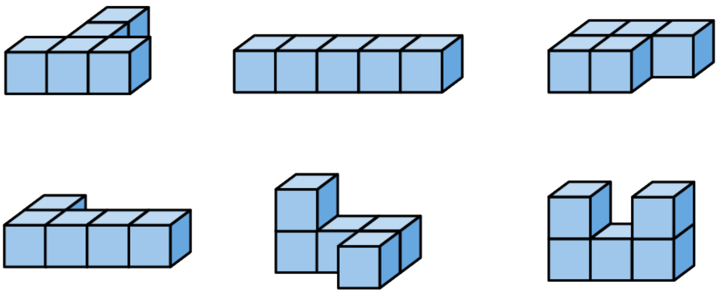


Figure 37: example compound 3D shapes composed of cubes

Pupils must also learn to copy compound shapes composed of other 3D shapes, including cuboids, cylinders, spheres and pyramids.

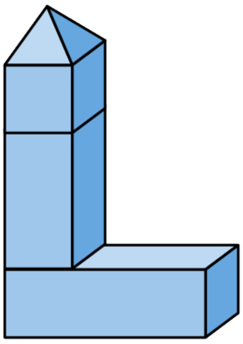


Figure 38: example compound shape composed of 4 different 3D shapes

Making connections

In [1AS–1](), pupils learn to compose and decompose numbers to 10. Here children are using composition and decomposition in the context of shapes, recognising that shapes can be combined to form a larger shape and decomposed to return to the original shapes.

1G–2 Example assessment questions

1. Task: Give each pupil some multilink cubes. Present pupils with a shape composed of multilink cubes and ask them to copy it.
2. Task: Give each pupils some pattern block pieces. Present pupils with a pattern block picture and ask them to copy it.
3. Task: Give each pupil some building blocks. Build a tower from different-shaped building blocks, then ask pupils to copy it .
4. Task: Give each pupil a set of identical 2D shapes (for example, equilateral triangles of equal size). Make a pattern from the set of identical shapes and ask pupils to copy it.

Assessment guidance: Practical work, carried out in small groups, provides the most reliable method of assessing whether pupils have met this criterion. Teachers should carefully watch pupils to assess their ability to rotate shapes to match those within the patterns, pictures and arrangements, and to place shapes relative to other shapes.

Calculation and fluency

1NF–1 Fluently add and subtract within 10

Develop fluency in addition and subtraction facts within 10.

The main addition and subtraction calculation focus in year 1 is developing fluency in additive facts within 10, as outlined in the **1NF–1 Teaching guidance**

Fluency in these facts allows pupils to more easily master addition and subtraction with 2-digit numbers in year 2, and underpins all future additive calculation. Pupils should practise carrying out addition and subtraction calculations, and working with equations in different forms, such as those below, until they achieve automaticity. Pupils should begin to recognise the inverse relationship between addition and subtraction, and use this to calculate. For example, if a pupil knows $6+4=10$, then they should be able to reason that $10-4=6$ and $10-6=4$.

Pupils should also be expected to solve contextual addition and subtraction calculations with the 4 structures described in **1AS–2** (aggregation, partitioning, augmentation and reduction), for calculation within 10.

$5+2=\square$	$6+4=\square$	$\square=1+8$	$\square=3+4$
$5+\square=8$	$\square+1=7$	$6=\square+2$	$10=5+\square$

$8-7=\square$	$7-2=\square$	$6-3=\square$	$\square=9-5$
$\square-3=4$	$9-\square=7$	$3=\square-5$	$2=10-\square$

Pupils will need extensive practice, throughout the year, to achieve the fluency required to meet this criterion.

1NF–2 Count forwards and backwards in multiples of 2, 5 and 10

Count forwards and backwards in multiples of 2, 5 and 10, beginning with any multiple, and count forwards and backwards through the odd numbers.

Pupils must be fluent in counting in multiples of 2, 5 and 10 by the end of year 1. Although this is the basis of multiplication and division by 2, 5, and 10, pupils do not need to be introduced to the words ‘multiplication’ and ‘division’ or to the multiplication and division symbols ($\times$ and $\div$) in year 1, and are not expected to solve calculations presented as written equations. However, through skip counting (using practical resources, images such as number lines, or their fingers) pupils should begin to solve contextual multiplication and quotitive division problems, involving groups of 2, 5 or 10, for example:

- “I have four 5p coins. How much money do I have altogether?”
- “There are 10 apples in each bag. How many bags do I need to have 60 apples?”

Pupils will need extensive practice, throughout the year, to achieve the fluency required to meet this criterion

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