Primary Mathematics Scheme of Work: Stage 3

Unit	Lessons			Key 'Build a Mathematician' (BAM) Indicators	Essential knowledge
	Autumn	Spring	Summer		
Numbers and the number system	10	--	--	• Read and write numbers up to 1000 in numerals and in words • Compare and order whole numbers up to 1000 • Count from zero in multiples of 4, 8, 50 and 100 • Add and subtract numbers mentally including a three-digit number and ones, tens and hundreds • Use columnar addition and subtraction with numbers up to three digits • Use known facts to multiply and divide mentally within the 2, 3, 4, 8 and 10 multiplication tables • Multiply a two-digit number by a one-digit number • Understand fractions as proportions • Understand fractions as numbers • Count forward and backwards in tenths • Tell the time using analogue and digital 12-hour clocks • Measure length (mm, cm, m), mass (g, kg) and capacity (ml, l) • Measure perimeters of shapes Stage 3 BAM Progress Tracker Sheet	• Know the place value headings of tenths, ones, tens and hundreds • Know multiplication facts for the 3, 4 and 8 multiplication tables • Know division facts related to the 3, 4 and 8 multiplication tables • Know that a right angle is ¼ of a turn • Know the number of days in each month • Know the number days in a year and a leap year • Know that 60 seconds = 1 minute • Know the Roman numerals from I to XII • Know the vocabulary of time including o'clock, a.m., p.m., morning afternoon, noon and midnight • Know the meaning of 'perimeter'
Counting and comparing	10	--	--		
Visualising and constructing	5	--	--		
Calculating: addition and subtraction	15	10	5		
Calculating: multiplication and division	10	10	5		
Exploring time	10	--	--		
Exploring fractions	10	10	--		
Measuring space	--	15	--		
Investigating angles	--	--	10		
Calculating fractions and decimals	--	--	10		
Exploring money	--	10	--		
Presentation of data	--	--	10		
Preventing the gap / Going deeper					
Total:	140				

w/c 2/9/2019	Numbers and the number system	w/c 4/11/2019	Calculating: multiplication and division	w/c 6/1/2020	Calculating: addition and subtraction	w/c 24/2/2020	Exploring fractions	w/c 20/4/2020	Presentation of data	w/c 1/6/2020	Calculating fractions & decimals
w/c 9/9/2019		w/c 11/11/20		w/c 13/1/202		w/c 2/3/2020		w/c 27/4/2020		w/c 8/6/2020	
w/c 16/9/2019	Exploring time	w/c 18/11/2019	Exploring fractions	w/c 20/1/2020	Calculating: multiplication and division	w/c 9/3/2020	Measuring space	w/c 4/5/2020	Investigating angles	w/c 15/6/2020	Calculating: addition and subtraction
w/c 23/9/201		w/c 25/11/20		w/c 27/1/2020		w/c 16/3/202	**Whole School Assessment Week**	w/c 1/5/2020		w/c 22/6/202	Calculating: multiplication and division
w/c 30/9/2019	Visualising and constructing	w/c 2/12/2019	**Whole School Assessment Week**	w/c 3/2/2020	Exploring money	w/c 23/3/2020	Measuring space	w/c 18/5/2020	**Consolidation**	w/c 29/6/2020	**Whole School Assessment Week**
w/c 7/10/2019	Calculating: addition and subtraction	w/c 9/12/2019	Counting and comparing	w/c 10/2/2020		w/c 30/3/2020				w/c 6/7/2020	**Consolidation & Getting ready for Year 4**
w/c 14/10/2019		w/c								w/c 13/7/2020	
w/c 21/10/2019										w/c 20/7/2020	

Numbers and the number system — *8 lessons*

Key concepts (National Curriculum statements)

The Big Picture: Number and Place Value progression map

- recognise the place value of each digit in a three-digit number (hundreds, tens, ones)
- read and write numbers up to 1000 in numerals and in words
- identify, represent and estimate numbers using different representations
- solve number problems and practical problems involving these ideas

Notes and guidance (non-statutory)

- They use larger numbers to at least 1,000, applying partitioning related to place value using varied and increasingly complex problems, building on work in year 2 (for example, 146 = 100 + 40 + 6, 146 = 130 +16).
- Using a variety of representations, including those related to measure, pupils continue to count in 1s, 10s and 100s, so that they become fluent in the order and place value of numbers to 1,000.
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Continuum References

Band 3 (R-WT)

Demonstrates understanding of 'more'
Demonstrates understanding of 1:1 correspondence in range of contexts and counts reliably to 3
Joins in rote counting to 5
Joins in with new number rhymes, songs stories, games

Band 4 (R-WT)

Counts at least 5 objects reliably
Recognises numerals from one to five and to understands that each represents a constant number or amount
Joins in rote counting to 10

Band 5 (R-AT)

Counts reliably with numbers from one to 20, places them in order
Begins to use ordinal numbers (first , second, last) when describing the position of objects
Begins to recognise numerals 1-9 and relate them to sets of objects
Recognises differences in quantity
Estimates a small number and checks by counting
Continues counting from a given small number up to 10
Joins in with rote counting beyond 10

Band 6 (1-WT)

Counts, reads and writes numbers to 10
Counts in 2's forward and backwards to 10

Band 7 (1-WT)

Counts, reads, orders and writes numbers to 20
Reads and writes numbers to ten in words
Counts in 2's forward and backwards to 20
Counts in 10's to 100
Given a number can identify one more

Band 8 (1-AT)

Counts to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number
Counts, reads and writes numbers to 100 in numerals and to 20 in words; counts in multiples of twos, fives and tens
Uses the language of: equal to, more than, less than (fewer), most least
Identifies and represents numbers using objects and pictorial representations including the number line
When given a number (to 100), identifies one more and one less

Band 9 (2-WT)

Beginning to recognise place value in two digit numbers practically
Practically compares and orders numbers to 100
Using a number square identifies 10 more and 10 less

Band 10 (2-AT)

Counts in steps of 2,3, and 5 from 0, and in tens from any number, forward or backward
Compares and orders numbers from 0 up to 100; uses <,> and = signs
Identifies, represents and estimates numbers using different representations, including the number line
Reads and writes numbers to at least 100 in numerals and in words
Recognises the place value of each digit in a two-digit number (tens, ones)
Partitions two digit numbers
Using a number square can calculate 9 more, 9 less, 11, more and 11 less by adjusting

Possible themes

- Work with numbers up to 1000
- Explore ways of representing numbers
- Develop skills of estimation
- Solve problems involving numbers and the number system

Bring on the Maths⁺: Lower Key Stage 2
Number and Place Value: Place value I, Place value headings, Reading and writing numbers

Possible key learning points

- Understand place value in numbers up to 1000
- Write numbers up to 1000
- Read numbers up to 1000
- Use zero as a place holder in numbers up to 1000
- Interpret numbers up to 1000 on a number line
- Represent numbers up to 1000 using a number line
- Interpret and use scales representing measurements with numbers up to 1000
- Use scales to represent measurements with numbers up to 1000

Prerequisites

- Understand place value in numbers up to two digits
- Read and write numbers up to 100
- Use zero as a place holder in two-digit numbers
- Use and interpret a number line to represent numbers

Mathematical language

Place value
Digit
Hundreds
Tens
Ones
Estimate
Number line
Scale

Pedagogical notes

Pupils should be given opportunity to explain reasoning both verbally and in writing

NCETM: Glossary

Useful resources: Dienes apparatus, place value cards, digit cards, number lines, bead strings, unifix or multi link cubes, cuisenaire rods, Numicon, 100 square

Common approaches
Every classroom displays a number line up to 1000
Every classroom has a place value chart on the wall

Reasoning opportunities and probing questions

- Show me a three-digit number with a tens unit of '6'. And another. And another …
- Benny writes the number three hundred and six as '3006'. Do you agree with Benny?
- Using a number line, show me the number 243, 567, 909, etc.

NCETM: Place Value Reasoning

Suggested activities

NRICH: Which scripts?
NRICH: Which is quicker?

Learning review
KM: 3M1 BAM Task
NCETM: NC Assessment Materials (Teaching and Assessing Mastery)

Possible misconceptions

- Some pupils may write three-digit numbers literally, for example, four hundred and six as '4006'
- Some pupils may ignore place value and simply write the digits mentioned in a number, for example, four hundred and six as '46'

Concrete

Pictorial

Abstract

PUMA assessment criteria			NCETM- Exemplification
Autumn	Spring	Summer	recognise the place value of each digit in a three-digit number (hundreds, tens, ones) ➢ For each of these numbers: 428, 205, 130, 25, 7, 909. Tell me: How many hundreds? How many tens it has? How many ones? identify, represent and estimate numbers using different representations ➢ Show me 642 on a number line, with Dienes apparatus, with place value cards, on a Gattegno grid; b) What number is halfway between 65 and 95? How do you know? read and write numbers up to 1000 in numerals and words ➢ Read these numbers 428, 205, 130, 25, 7, 909 solve number problems and practical problems involving these ideas ➢ a) Jack walks 645 metres to school. Suzy walks 100 metres less. How far does Suzy walk?; b) What is 1 more than 485? Than 569? Than 299?; c) What number needs to go into each triangle? Explain why? 642 = 600 + Δ + 2 967 = Δ + 60 + 7
Recognise the place value of each digit in a three-digit number (hundreds, tens, ones) Identify, represent and estimate numbers using different representations including those related to measure e.g. using place value cards to show 985 = 900 + 80 + 5; tally marks; base 10 apparatus. Read and write numbers to at least 1000 in numerals Compare and order numbers up to 1000 Solve number problems and practical problems involving place value and rounding. Apply partitioning related to place value using varied and increasingly complex problems e.g. 146 = 100 and 40 and 6, 146 = 130 and 16	Recognise the place value of each digit in a three-digit number (hundreds, tens, ones) Identify, represent and estimate numbers using different representations including those related to measure Read and write numbers to at least 1000 in numerals and in words e.g. three hundred and forty-six Compare and order numbers up to 1000 Solve number problems and practical problems involving place value and rounding Apply partitioning related to place value using varied and increasingly complex problems	Recognise the place value of each digit in a three-digit number (hundreds, tens, ones) Identify, represent and estimate numbers using different representations including those related to measure Read and write numbers to at least 1000 in numerals and in words Compare and order numbers up to 1000 Solve number problems and practical problems involving place value and rounding Apply partitioning related to place value using varied and increasingly complex problems	

Counting and comparing — *12 lessons*

Key concepts (National Curriculum statements)

The Big Picture: Number and Place Value progression map

- compare and order numbers up to 1000
- count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number
- solve number problems and practical problems involving these ideas

Non Statuary guidance

- Pupils now use multiples of 2, 3, 4, 5, 8, 10, 50 and 100.

Continuum References

Band 3 (R-WT)

Demonstrates understanding of 'more'
Demonstrates understanding of 1:1 correspondence in range of contexts and counts reliably to 3
Joins in rote counting to 5
Joins in with new number rhymes, songs stories, games

Band 4 (R-WT)

Counts at least 5 objects reliably
Recognises numerals from one to five and to understands that each represents a constant number or amount
Joins in rote counting to 10Band 4 (R-WT)

Band 5 (R-AT)

Counts reliably with numbers from one to 20, places them in order
Begins to use ordinal numbers (first , second, last) when describing the position of objects
Begins to recognise numerals 1-9 and relate them to sets of objects
Recognises differences in quantity
Estimates a small number and checks by counting
Continues counting from a given small number up to 10
Joins in with rote counting beyond 10

Band 6 (1-WT)

Counts, reads and writes numbers to 10
Counts in 2's forward and backwards to 10

Band 7 (1-WT)

Counts, reads, orders and writes numbers to 20
Reads and writes numbers to ten in words
Counts in 2's forward and backwards to 20
Counts in 10's to 100
Given a number can identify one more

Band 8 (1-AT)

Counts to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number
Counts, reads and writes numbers to 100 in numerals and to 20 in words; counts in multiples of twos, fives and tens
Uses the language of: equal to, more than, less than (fewer), most least
Identifies and represents numbers using objects and pictorial representations including the number line
When given a number (to 100), identifies one more and one less

Band 9 (2-WT)

Beginning to recognise place value in two digit numbers practically
Practically compares and orders numbers to 100
Using a number square identifies 10 more and 10 less

Band 10 (2-AT)

Counts in steps of 2,3, and 5 from 0, and in tens from any number, forward or backward
Compares and orders numbers from 0 up to 100; uses <,> and = signs
Identifies, represents and estimates numbers using different representations, including the number line
Reads and writes numbers to at least 100 in numerals and in words
Recognises the place value of each digit in a two-digit number (tens, ones)
Partitions two digit numbers
Using a number square can calculate 9 more, 9 less, 11, more and 11 less by adjusting

Possible themes

- Work with numbers up to 1000
- Explore ways of counting
- Solve problems involving counting and comparing

Bring on the Maths[+]: Lower Key Stage 2
Number and Place Value: Ordering numbers, Counting I, Counting II

Possible key learning points

- Order numbers up to 1000
- Compare numbers up to 1000
- Count (from 0) in multiples of 4
- Count (from 0) in multiples of 8
- Count (from 0) in multiples of 50
- Count (from 0) in multiples of 100
- Find 10 more than a given number
- Find 10 less than a given number
- Find 100 more than a given number
- Find 100 less than a given number

Prerequisites

- Understand place value in numbers up to 1000
- Use <, > and = symbols
- Count in steps of 2, 3 and 5 from 0
- Count in tens from any number, forward and backward

Mathematical language

Place value
Digit
Multiple
More
Less
Positive
Number line

Notation
Use of <, > and = symbols when comparing numbers

Pedagogical notes

Zero is neither positive nor negative.
It is expected that all pupils should count from 0 in multiples of 4, 8, 50 and 100, but they should also be given the opportunity to start with any given number.

NCETM: Glossary

Useful resources: Dienes apparatus, place value cards, digit cards, number lines, bead strings, unifix/multi link cubes, Cuisenaire rods, Numicon, 100 square

Common approaches
Every classroom displays a number line up to 1000
Every classroom has a place value chart on the wall

Reasoning opportunities and probing questions

- Show me the largest three-digit number with a tens unit of '6', hundreds unit '2'. And Another. And another …
- What is the same and what is different: *345, 435, 545, 455* ?
- Convince me that 765 > 567.

NCETM: Place Value Reasoning

Suggested activities

NRICH: The Deca Tree
NCETM: Ordering numbers: Activity A
NCETM: The value of place: Activity E

Learning review
KM: 3M2 BAM Task, 3M3 BAM Task
NCETM: NC Assessment Materials (Teaching and Assessing Mastery)

Possible misconceptions

- Some pupils may write three-digit numbers literally, for example, four hundred and six as '4006'
- Some pupils may ignore place value and simply write the digits mentioned in a number, for example, four hundred and six as '46'

Concrete

Pictorial

Abstract

PUMA assessment criteria			NCETM- Exemplification
Autumn	Spring	Summer	compare and order numbers up to 1000 ➢ Sort these numbers into ascending order: 95, 163, 8, 740, 25, 0, 400, 303 solve number problems and practical problems involving these ideas ➢ a) Jack walks 645 metres to school. Suzy walks 100 metres less. How far does Suzy walk?; b) What is 1 more than 485? Than 569? Than 299?; c) What number needs to go into each triangle? Explain why? 642 = 600 + Δ + 2 967 = Δ + 60 + 7
Count from 0 in multiples of 4, 50 and 100; find 10 or 100 more or less than a given number e.g. 10 more than 395 Solve number problems and practical problems involving place value and rounding.	Count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number Solve number problems and practical problems involving place value and rounding	Count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number Solve number problems and practical problems involving place value and rounding	

Visualising and constructing — 8 lessons

Key concepts (National Curriculum statements)

The Big Picture: Properties of Shape progression map

- identify horizontal and vertical lines and pairs of perpendicular and parallel lines
- draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them

Notes and guidance (non-statutory)

- Pupils' knowledge of the properties of shapes is extended at this stage to symmetrical and non-symmetrical polygons and polyhedra. Pupils extend their use of the properties of shapes. They should be able to describe the properties of 2-D and 3-D shapes using accurate language, including lengths of lines and acute and obtuse for angles greater or lesser than a right angle.

Continuum References

Band 3 (R-WT)

Demonstrates understanding of 'more' - Asks for 'more' e.g. cups, food items as required
Demonstrates an understanding of 'less' - Indicates which bottle has less water in it

Band 4 (R-WT)

In practical situations responds to 'add one' to a number of objects - Responds to requests such as add one pencil to the pencils in the pot, add one sweet to the dish
In practical situations responds to 'add one' to or 'take one away' from a number of objects - Using objects placed on or people standing on a number track, adds or removes object and says, signs or indicates how many

Band 5 (R-AT)

Says which number is one more than a given number
Using quantities and objects, adds two single-digit numbers and counts on to find the answer
Says which number is one less than a given number
Using quantities and objects, subtracts two single-digit numbers and counts back to find the answer

Band 6 (1-WT)

Add numbers when solving problems involving 10 objects including problems with money and measures
Begins to recognise that addition can be done in any order
Understands the position of the largest number
Uses a numberline to count on to solve numerical addition problems to 10
Uses a numberline to count back to solve subtraction problems to 10
Begins to understand that subtraction must be completed in order
Begins to recognise that the largest number is always last and the largest number must go first

Band 7 (1-WT)

Understands the operation and language of addition:
Uses mental recall of addition facts to 10
Can complete 'missing' number sums to 10
Can make sums to total numbers to 10
Understands the operation and language of subtraction
Uses mental recall of subtraction facts to 10
Solves problems involving subtraction including finding the numerical difference between two sets including money and measures

Band 8 (1-AT)

Represents and uses number bonds and related subtraction facts within 20
Adds and subtracts one-digit and two-digit numbers to 20, including zero
Reads, writes and interprets mathematical statements involving addition and equals signs
Represents and uses related number bond facts to subtract within 20
Adds and subtracts one-digit and two-digit numbers to 20, including zero
Reads, writes and interprets mathematical statements involving subtraction and equals signs

Band 9 (2-WT)

Derives and uses addition facts to 20
Solves missing number sums to 20 without prompting
Adds three 1 digit numbers
Adds a 2 digit number and a 1 digit number by making jottings and using a numberline
Shows that 2 numbers eg. 2 + 8 is the same as 8 + 2 using images and resources
Derives and uses subtraction facts to 20
Subtracts 1 digit number from 2 digit number using jottings and a numberline

Band 10 (2-AT)

Recalls and uses addition facts to 20 fluently, and derive and use related facts up to 100
Adds numbers using concrete objects, pictorial representations, and mentally, including: a 2-digit number and ones, a 2-digit number and tens, two 2-digit numbers, adding 3 one-digit numbers
Records addition in columns using expanded format involving partitioning
Shows that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot
Recalls and uses subtraction facts to 20 fluently, and derive and use related facts up to 100
Subtracts numbers using concrete objects, pictorial representations, and mentally, including: a 2-digit number and ones, a 2-digit
Shows subtraction of one number from another cannot be done in any order
Checks answers using inverse
Solves missing number subtractions using inverse

Possible themes

- Classify lines
- Construct 2D shapes
- Explore 3D shapes

Possible key learning points

- Identify and draw horizontal and vertical lines
- Identify and draw parallel lines
- Identify and draw perpendicular lines
- Sketch common 2D shapes
- Draw and measure a line in centimetres
- Construct common 2D shapes using a ruler
- Make and identify 3D shapes using modelling materials
- Describe 3D shapes using mathematical language

Prerequisites

- Know the names of common 2D shapes
- Know the names of cuboids, prisms, spheres, pyramids and cones
- Know the meaning of side, edge, vertex (vertices) and face
- Use a straight edge to construct lines and shapes

Mathematical language

Horizontal
Vertical
Perpendicular
Parallel
Face, Edge, Vertex (Vertices)
Cube, Cuboid, Prism, Cylinder, Pyramid, Cone, Sphere
Quadrilateral
Square, Rectangle, Parallelogram, (Isosceles) Trapezium, Kite, Rhombus
Triangle, Circle
Polygon, Hexagon, Pentagon, Octagon, Decagon

Notation
Arrow notation to represent parallel lines
Right angle notation for perpendicular lines

Pedagogical notes

Pupils should be able to draw and measure a line in centimetres when the dimensions are whole numbers.
Suitable modeling materials include Polydron, Geomag, pipe cleaners and even (uncooked!) spaghetti and marshmallows for a bit of messy fun!

NCETM: Glossary

Common approaches
Every classroom has a set of 3D shape posters and quadrilateral posters on the wall

Reasoning opportunities and probing questions

- Show me a pair of parallel lines, perpendicular lines, a vertical line, a horizontal line. And Another …
- Always/Sometimes/Never: Perpendicular lines are horizontal and vertical.
- Convince me that parallel lines can be curved.
- Convince me that a square is a rectangle.

NCETM: Geometry - Properties of Shapes Reasoning

Suggested activities

NCETM: The Art of Mathematics: Activity D
NCETM: Making shapes and solids: Activity A

Learning review
NCETM: NC Assessment Materials (Teaching and Assessing Mastery)

Possible misconceptions

- Pupils may believe, incorrectly, that:
  - perpendicular lines have to be horizontal / vertical
  - only straight lines can be parallel
- Some pupils may think that a square and rectangle are two different shapes.
- Pupils may believe, incorrectly, that all 3-D shapes are prisms

Concrete

Pictorial

Abstract

PUMA assessment criteria			NCETM- Exemplification
Autumn	Spring	Summer	The requirements for Year 3 in Geometry: Properties of Shapes are quite explicit and exemplars are not particularly helpful. It is helpful, however, to understand that, in Year 3, pupils should be expected to demonstrate understanding in this area by: ➢ using appropriate mathematical vocabulary to describe the features of common 2-D and 3-D shapes including semicircles, hemispheres and prisms ➢ sorting and classifying collections of 2-D shapes in different ways using a range of properties including: 'all sides are of equal length,' 'has at least one right angle' or 'has at least one line of symmetry' ➢ recording their classifications on Venn and Carroll diagrams, including diagrams involving more than one criterion.
Draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations; and describe them e.g. number of faces, edges and vertices (singular: vertex), e.g. guess my shape: it has a square face and four triangular faces (square-based pyramid)	Draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations; and describe them	Draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations; and describe them	

Calculating: addition and subtraction — 12 lessons

Key concepts (National Curriculum statements)

The Big Picture: Calculation progression map

- add and subtract numbers mentally, including: a three-digit number and ones; a three-digit number and tens; a three-digit number and hundreds
- add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction
- estimate the answer to a calculation and use inverse operations to check answers
- solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction

Notes and guidance (non-statutory)

- Pupils practise solving varied addition and subtraction questions. For mental calculations with two-digit numbers, the answers could exceed 100.
- Pupils use their understanding of place value and partitioning, and practise using columnar addition and subtraction with increasingly large numbers up to 3 digits to become fluent (see Mathematics appendix 1).

Continuum References

Band 3 (R-WT)

Demonstrates understanding of 'more' - Asks for 'more' e.g. cups, food items as required
Demonstrates an understanding of 'less' - Indicates which bottle has less water in it

Band 4 (R-WT)

In practical situations responds to 'add one' to a number of objects - Responds to requests such as add one pencil to the pencils in the pot, add one sweet to the dish
In practical situations responds to 'add one' to or 'take one away' from a number of objects - Using objects placed on or people standing on a number track, adds or removes object and says, signs or indicates how many

Band 5 (R-AT)

Says which number is one more than a given number
Using quantities and objects, adds two single-digit numbers and counts on to find the answer
Says which number is one less than a given number
Using quantities and objects, subtracts two single-digit numbers and counts back to find the answer

Band 6 (1-WT)

Add numbers when solving problems involving 10 objects including problems with money and measures
Begins to recognise that addition can be done in any order
Understands the position of the largest number
Uses a numberline to count on to solve numerical addition problems to 10
Uses a numberline to count back to solve subtraction problems to 10
Begins to understand that subtraction must be completed in order
Begins to recognise that the largest number is always last and the largest number must go first

Band 7 (1-WT)

Understands the operation and language of addition:
Uses mental recall of addition facts to 10
Can complete 'missing' number sums to 10
Can make sums to total numbers to 10
Understands the operation and language of subtraction
Uses mental recall of subtraction facts to 10
Solves problems involving subtraction including finding the numerical difference between two sets including money and measures

Band 8 (1-AT)

Represents and uses number bonds and related subtraction facts within 20
Adds and subtracts one-digit and two-digit numbers to 20, including zero
Reads, writes and interprets mathematical statements involving addition and equals signs
Represents and uses related number bond facts to subtract within 20
Adds and subtracts one-digit and two-digit numbers to 20, including zero
Reads, writes and interprets mathematical statements involving subtraction and equals signs

Band 9 (2-WT)

Derives and uses addition facts to 20
Solves missing number sums to 20 without prompting
Adds three 1 digit numbers
Adds a 2 digit number and a 1 digit number by making jottings and using a numberline
Shows that 2 numbers eg. 2 + 8 is the same as 8 + 2 using images and resources
Derives and uses subtraction facts to 20
Subtracts 1 digit number from 2 digit number using jottings and a numberline

Band 10 (2-AT)

Recalls and uses addition facts to 20 fluently, and derive and use related facts up to 100
Adds numbers using concrete objects, pictorial representations, and mentally, including: a 2-digit number and ones, a 2-digit number and tens, two 2-digit numbers, adding 3 one-digit numbers
Records addition in columns using expanded format involving partitioning
Shows that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot
Recalls and uses subtraction facts to 20 fluently, and derive and use related facts up to 100
Subtracts numbers using concrete objects, pictorial representations, and mentally, including: a 2-digit number and ones, a 2-digit
Shows subtraction of one number from another cannot be done in any order
Checks answers using inverse
Solves missing number subtractions using inverse

Possible themes

- Extend mental methods of addition and subtraction
- Develop written methods of addition and subtraction
- Estimate answers to calculations
- Solve problems involving addition and subtraction

Bring on the Maths+: Lower Key Stage 2
Calculating: Addition and subtraction using mental methods, Addition and subtraction using written methods I

Possible key learning points

- Add three-digit numbers and ones or tens mentally
- Add three-digit numbers and hundreds mentally
- Subtract three-digit numbers and one or tens mentally
- Subtract three-digit numbers and hundreds mentally
- Use column addition for numbers with up to three digits when carrying is not required
- Use column addition for three-digit and two-digit numbers when carrying is required
- Use column addition for numbers with three-digits when carrying is required
- Use column subtraction for numbers with up to three digits when exchanging is not required
- Use column subtraction for three-digit and two-digit numbers when exchanging is required
- Use column subtraction for numbers with up to three-digits when exchanging is required
- Estimate the answer to a calculation
- Identify when addition or subtraction is needed as part of solving a problem

Prerequisites

- Know that addition and subtraction are inverse operations
- Recall addition and subtraction facts to 20
- Derive addition and subtraction facts to 100
- Add and subtract two-digit numbers and ones (or tens) mentally

Mathematical language

Calculation
Calculate
Addition
Subtraction
Sum, Total
Difference, Minus, Less
Column addition
Column subtraction
Exchange
Operation
Estimate
Inverse
Operation

Pedagogical notes

Interpret 'mentally' as 'can you do the calculation in your head or with jottings?'. The Kangaroo Maths Interactive Target Boards are very powerful in supporting this important message. Ensure that pupils can deal with column subtractions that include a 0 within the first number; e.g. 8027 – 437
KM: Progression: Addition and Subtraction and Calculation overview
NCETM: The Bar Model, Subtraction, Glossary
Useful resources: Digit cards, number lines, bead strings, place-value cards, base 10, 100 squares, place-value counters

Common approaches
All teachers use 'sum' to refer only to the result of an addition. Teachers must say 'complete these calculations' instead of 'complete these sums'. All pupils use books / paper with 1cm squares and ensure that each digit is written in one square. When carrying, those numbers being carried are placed beneath the answer line. During column subtraction the language of 'exchanging' is used instead of 'borrowing'. When exchanging, those numbers being altered or moved are written above the calculation

Reasoning opportunities and probing questions

- Provide examples of column addition and subtraction with missing digits. Challenge pupils to find these digits and explain their reasoning.
- Show me an example of a column addition (that does not includes carrying) with the answer 576. And Another …
- Show me an example of a column addition (that includes carrying) with the answer 512. And Another …
- Convince me that 428 – 136 = 292

NCETM: Addition and Subtraction Reasoning

Suggested activities

KM: Interactive target boards
KM: Maths to Infinity: Addition and subtraction foundations
NRICH: Reach 100, Twenty Divided Into Six, Consecutive Numbers
NCETM: Triangular cards: Activity E
NCETM: Interactive Base 10 Blocks: Activity F, G and H
NCETM: Estimating differences: Activity F

Learning review
KM: 3M4 BAM Task, 3M5 BAM Task
NCETM: NC Assessment Materials (Teaching and Assessing Mastery)

Possible misconceptions

- Some pupils may carry the wrong carry digit (i.e. the ones digit rather than the tens digit)
- Some pupils incorrectly assume and use commutativity within column subtraction; for example:

$$\begin{array}{rrrr} & 9 & 2 & 6 \\ - & 7 & 3 & 4 \\ \hline & 2 & 1 & 2 \end{array}$$

- Some pupils may not use place value settings correctly (especially when the numbers have a different number of digits)

Concrete

Pictorial

Abstract

PUMA assessment criteria

Autumn	Spring	Summer
Add and subtract numbers mentally, including: o a three-digit number and ones o a three-digit number and tens o a three-digit number and hundreds e.g. 858 – 300 o two-digit numbers where the answer could exceed 100 e.g. 99+18 Add and subtract numbers with up to three digits Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction e.g. investigate the numbers which could go in the boxes when Apply partitioning related to place value using varied and increasingly complex problems e.g. 146 = 100 and 40 and 6, 146 = 130 and 16	Add and subtract numbers mentally, including: o a three-digit number and ones o a three-digit number and tens e.g. 476 + 50 o a three-digit number and hundreds. o two-digit numbers where the answer could exceed 100 Add and subtract numbers with up to three digits, using formal written methods of columnar addition Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction e.g. There are 46 boys and 58 girls in Year 3, but 12 children are away; how many Year 3 children are at school? Apply partitioning related to place value using varied and increasingly complex problems	Add and subtract numbers mentally, including: o a three-digit number and ones o a three-digit number and tens e.g. 824 – 30 o a three-digit number and hundreds o two-digit numbers where the answer could exceed 100 e.g. 68+47 Add and subtract numbers with up to three digits, using the efficient written methods of columnar addition and subtraction Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction e.g. investigate the numbers which could go in the boxes when Apply partitioning related to place value using varied and increasingly complex problems

NCETM- Exemplification

add and subtract numbers mentally, including a three-digit number and ones, a three-digit number and tens, three-digit number and hundreds
add and subtract numbers with up to three digits, using formal written methods of column addition and subtraction
estimate the answer to a calculation and use inverse operations to check answers
solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction

Examples below, addressing combinations of the requirements above, are taken from a variety of publications.

- What number is 27 more than 145? What number is 19 more than 145? Explain how you worked out these two calculations.
- Work out the missing digits:
  3☐ + ☐2 = 85
- Work out these subtraction calculations:
  72 – 5 372 – 68 270 – 3
  82 – 15 132 – 28 70 – 66
  Did you use the same method for each calculation? If not, why not? Explain your methods to a friend and compare your methods with theirs.
- Paul says 172 – 15 = 163. Write down an addition calculation that you could do to check this.
  Paul's working is: 170 – 10 = 160 and 5 – 2 = 3 so 172 – 15 = 163
  Can you identify where Paul has gone wrong?
- Layla has 45p in her money bank and 28p in her purse. How much more money does she need to buy a comic that costs £1?
- Ben and Jess are answering this problem:
  Mary has collected 61 key rings, Jo has 45. How many more key rings does Mary have than Jo?
  Ben does the calculation 61 + 45. Jess does the calculation 61 – 45. Who is correct? Explain how you know.
  Josh buys one coconut and half a kilogram of bananas. What does he pay? Show your working.
  Coconut Bananas
  78p £1.50 per kg
  Explain your method to a friend.

- Holly has these coins.

  She wants to buy a notebook costing £1.50.
  How much more money does she need?
  I pay for a coach trip costing £7.80 with a £10 note. How much change should I get?
- A film starts at 6:30 pm and ends at 8:10 pm. How many minutes does the film last?
- I travel on a journey lasting 1 hour 25 minutes. The train leaves the station at 7:45 am. What time does the train arrive?
- What number is 199 more than 428?
- What is the difference between 1999 and 4003?
- One orange costs 15p. How much wo
- Would you use a mental, written or calculator method to solve each of these? Explain your choice.
  - 23.05 + ☐ = 176.25
  - What is the total cost if I buy food costing £3.86 and £8.57?
- These are the start and finish times of a film.
  START 14:05 FINISH 16:25
  How long was the film?
- A packet of crisps costs 32p. Josh buys two packets.
  How much change does he get from £1?
- Ryan buys sunglasses for £4.69 and a sun hat. How much change does he get from £10?

Calculating: multiplication and division — 12 lessons

Key concepts (National Curriculum statements)

The Big Picture: Calculation progression map

- recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods
- solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects

Notes and guidance (non-statutory)

- Pupils continue to practise their mental recall of multiplication tables when they are calculating mathematical statements in order to improve fluency. Through doubling, they connect the 2, 4 and 8 multiplication tables.
- Pupils develop efficient mental methods, for example, using commutativity and associativity (for example, 4 × 12 × 5 = 4 × 5 × 12 = 20 × 12 = 240) and multiplication and division facts (for example, using 3 × 2 = 6, 6 ÷ 3 = 2 and 2 = 6 ÷ 3) to derive related facts (30 × 2 = 60, 60 ÷ 3 = 20 and 20 = 60 ÷ 3).
- Pupils develop reliable written methods for multiplication and division, starting with calculations of two-digit numbers by one-digit numbers and progressing to the formal written methods of short multiplication and division.

Pupils solve simple problems in contexts, deciding which of the 4 operations to use and why. These include measuring and scaling contexts, (for example 4 times as high, 8 times as long etc) and correspondence problems in which m objects are connected to n objects (for example, 3 hats and 4 coats, how many different outfits?; 12 sweets shared equally between 4 children; 4 cakes shared equally between 8 children).

Continuum References

Band 3 (R-WT)	Band 6 (1-WT)	Band 8 (1-AT)	Band 9 (2-WT)	Band 10 (2-AT)
N/A	Counts in 2's to 10 forwards and back Opportunities to engage in practical situations eg. pair objects such as socks and shoes to develop and use appropriate language	Counts in multiples of twos, fives and tens to 100 Uses repeated addition to solve multiplication problems in practical situations Understands doubling by grouping objects Uses arrays to show multiplication and record grouping when doing division Begins to use repeated subtraction to share objects practically In practical situations begins to work out how many items each child will get eg. sharing grapes	Uses 'arrays' to understand multiplication Recalls 2 and 10 multiplication tables Understands multiplication as 'lots of' Begins to show that multiplication can be done in any order using images or manipulatives Solves simple missing number sums involving known tables Uses 'arrays' to support use of division Understands division as sharing Begins to show that division cannot be done in any order using images and manipulatives	Recalls and uses multiplication facts for the 2,5 and 10 multiplication tables, including recognising odd and even numbers Calculates mathematical statements for multiplication within the multiplication tables and writes them using the multiplication and equals signs Shows that multiplication of two numbers can be done in any order (commutative) Recalls and uses division facts for the 2,5 and 10 multiplication tables, including recognising odd and even numbers Calculates mathematical statements for division within the multiplication tables and writes them using the division and equals signs Shows that division of two numbers cannot be done in any order
Band 4 (R-WT)	**Band 7 (1-WT)**			
N/A	Counts in 2's to 20 forwards and back Counts in 2's forwards and back from a given number to 20 Begins to count in 10's to 100 Opportunities to engage in practical situations involving sharing within the classroom to develop and use appropriate language			
Band 5 (R-AT)				
N/A				

Possible themes

- Develop mental arithmetic skills
- Develop knowledge of multiplication tables
- Explore ways of writing calculations
- Solve problems involving multiplication and division

Bring on the Maths+: Lower Key Stage 2

Times tables: The three times table, The four times table, The eight times table

Possible key learning points

- Recall and use multiplication facts for the 3 times table
- Recall and use multiplication facts for the 4 times table
- Recall and use multiplication facts for the 8 times table
- Recall and use division facts for the 3 times table
- Recall and use division facts for the 4 times table
- Recall and use division facts for the 8 times table
- Understand the distributive law applied to a multiplication of a two-digit number by a one-digit number
- Identify the correct operation(s) required in order to solve a problem and create mathematical statements
- Use known and derived facts when multiplying and dividing mentally
- Use efficient methods to multiply a two-digit number by a one-digit number
- Identify when a scaling (or correspondence problem) can be solved using multiplication or division

Prerequisites

- Recall multiplication and division facts for 2, 5 and 10 multiplication tables
- Understand that multiplication and division are inverse operations
- Understand that multiplication is commutative

Mathematical language

Calculation
Calculate
Mental arithmetic
Multiplication table, Times table
Multiply, Multiplication
Times
Product
Commutative
Divide, Division
Inverse
Operation
Estimate

Pedagogical notes

Pupils make the connection between arrays, multiplying using the distributive law and the compact grid method. The transition from arrays to a compact grid method aids conceptual understanding of short and long multiplication. It also supports the multiplication of algebraic expressions at a later stage.

KM: Progression: Multiplication and Division and Calculation overview
NCETM: The Bar Model, Multiplication and division
NCETM: Multiplicative reasoning
NCETM: Glossary
Useful resources: Counters, Hundred squares, Times table squares, Counting stick, Cuisenaire rods, Place value discs

Common approaches

Knowing the times tables is understood as knowing multiplication facts, knowing division facts and related facts.
All classrooms display a times table poster with a twist
Connecting the compact grid method with arrays is essential

Reasoning opportunities and probing questions

- Show me a multiplication (division) fact from the 3 multiplication table, 4 multiplication table, 8 multiplication table. And Another …
- Ask pupils to complete the statement: '*If I know 7* × 4 = 28, then …'
- Show me a problem that can be solved using multiplication, division. And Another …
- Convince me that 40 × 8 = 320
- Convince me that 43 × 8 = 344

NCETM: Multiplication and Division Reasoning

Suggested activities

KM: Interactive target boards
KM: Maths to Infinity: Multiplication and division foundations
KM: Times Tables resources
NRICH: Andy's Marbles
NCETM: Always, Sometimes, Never: Activity A
NCETM: Pendulum Counting: Activity B
NCETM: Multiplying Numbers: Activity D

Learning review

KM: 3M6 BAM Task, 3M7 BAM Task
NCETM: NC Assessment Materials (Teaching and Assessing Mastery)

Possible misconceptions

- Some pupils 'see' the times tables as a list of 12 unconnected facts
- Some pupils do not understand multiplication is commutative.
- Some pupils may write statements such as 2 ÷ 8 = 4
- Some pupils think because 3 × 5 = 5 × 3 then 15 ÷ 3 = 3 ÷ 15

Concrete

Pictorial

Abstract

PUMA assessment criteria			NCETM- Exemplification
Autumn	Spring	Summer	recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables ➢ multiply seven by three; what is four multiplied by nine? Etc. ➢ Circle three numbers that add to make a multiple of 4 11 12 13 14 15 16 17 18 19 ➢ Leila puts 4 seeds in each of her pots. She uses 6 pots and has 1 seed left over. How many seeds did she start with? ➢ At Christmas, there are 49 chocolates in a tin and Tim shares them between himself and 7 other members of the family. How many chocolates will each person get? write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods ➢ One orange costs nineteen pence. How much will three oranges cost? ➢ Mark drives 19 miles to work every day and 19 miles back. He does this on Mondays, Tuesdays, Wednesdays, Thursdays and Fridays. How many miles does he travel to work and back in one week? solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects ➢ Miss West needs 28 paper cups. She has to buy them in packs of 6 ➢ How many packs does she have to buy?
Solve problems, including missing number problems, involving multiplication and division e.g. 90 = 3 ×	Solve problems, including missing number problems, involving multiplication and division e.g. 240 = × 4	Solve problems, including missing number problems, involving multiplication and division, including integer scaling problems (e.g. change a recipe for 2 people to make enough for 6 people) and correspondence problems in which n objects are connected to m objects. e.g. 3 hats and 4 coats, how many different outfits? Or Share 6 cakes equally between 4 children.	

Exploring time — *12 lessons*

Key concepts (National Curriculum statements)

The Big Picture: Measurement and mensuration progression map

- tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks
- estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes and hours; use vocabulary such as o'clock, a.m./p.m., morning, afternoon, noon and midnight
- know the number of seconds in a minute and the number of days in each month, year and leap year
- compare durations of events [for example to calculate the time taken by particular events or tasks]

Notes and guidance (non-statutory)

- Pupils use both analogue and digital 12-hour clocks and record their times. In this way they become fluent in and prepared for using digital 24-hour clocks in year 4.

Continuum References

Band 3 (R-WT)	Band 6 (1-WT)	Band 8 (1-AT)	Band 9 (2-WT)	Band 10 (2-AT)
N/A	Recognises the order of events in the school day using visual images	Sequences events in chronological order using language eg. before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening Recognises and uses language relating to dates, including days of the week, weeks, months and years Tells the time to the hour and half past the hour and draw the hands on a clock face to show these times.	Chooses and uses an appropriate standard unit of measurement eg. *selects a ruler marked in centimetres to measure the length of a pencil, minutes to measure time taken to do a task.* Tells the time to quarter past the hour and draw the hands on a clock face. With support interpret 'to' correctly with appropriate prompts. Begins to recognise that there are 60 minutes in an hour and count intervals in lots of 5.	Compares and sequences intervals of time Tells and writes the time to five minutes, including quarter past/to the hour and draw the hands on a clock face to show these times Knows the number of minutes in an hour and the number of hours in a day.
Band 4 (R-WT)	**Band 7 (1-WT)**			
N/A	Describes everyday events using the appropriate sequencing language (e.g. before, after, later etc) Chants the days of the week and the months of the year in order and, with support, identify today's date. Tells the time for o'clock and show on the hands of a clock			
Band 5 (R-AT)				
Shows awareness of time, through some familiarity with names of the days of the week and significant times in their day, e.g. bedtime Understands now, next and after				

Possible themes

- Understand and use Roman numerals
- Tell the time
- Estimate time
- Solve problems involving time

Bring on the Maths⁺: Lower Key Stage 2

Measures: Months of the year, Telling the time

Possible key learning points

- Read Roman numerals up to XII
- Know the vocabulary of telling the time
- Know the number of seconds in a minute
- Know the number of days in each month, year and leap year
- Tell the time from a 12-hour analogue clock to the nearest minute
- Tell the time from a 24-hour analogue clock to the nearest minute
- Tell the time from a clock using Roman numerals to the nearest minute
- Write times using 12-hour format
- Estimate times
- Compare times given in seconds, minutes and/or hours
- Calculate the time taken by particular events or tasks

Prerequisites

- Know the number of minutes in an hour, hours in a day, and days in a week
- Tell and write the time to the nearest five minutes

Mathematical language

Analogue
12-hour
24-hour
o'clock
Morning
Afternoon
Noon, Midnight
Second, Minute, Hour
Day, Week, Month
Year
Leap year
Roman Numeral

Notation

The Roman numeral for 4 is IV. It is the only exception to the rules of Roman numerals as it is sometimes written IIII on a clock or watch
Using a.m. and p.m. for 12-hour clock notation

Pedagogical notes

In general it is incorrect to repeat a Roman numeral symbol four times (i.e. XXXX). Also, the subtractive method should only be used (1) if subtracting powers of ten (i.e. I, X or C), and (2) if subtracting from the next two higher symbols (for example, I can be subtracted from V or X, but not L, C, D or M). Therefore 49 cannot be written as XXXXIX, or as IL, and must be written as XLIX. See NCETM: Roman numerals
24 clock notation using four digits. Any time before 10:00 a.m. uses a zero as the second hour digit, for example 9:15 a.m. is written as '09:15'.
Noon is 12:00 and midnight is 00:00
NCETM: Glossary

Common approaches

Explain the origins of the Roman numerals I, V and X are possibly linked to the human body being used to communicate numbers across the marketplace (I – finger, V – shape of the hand with fingers closed together and X – arms crossed)
Use of a colon to write 12- and 24- hour times
Using a.m. and p.m. for 12-hour clock notation
Noon is treated as 12:00 and midnight as 00:00

Reasoning opportunities and probing questions

- Can a 24-hour clock be analogue? For example, try and tell the time using images of the Greenwich Observatory Clock.
- What is the same and what is different: *VII, 7, I, IV* ?
- Always, sometimes, never: Only one month has 28 days.

NCETM: Measurement Reasoning

Suggested activities

NRICH: Two Clocks
NCETM: Virtual Clock: Activity D

Learning review

KM: 3M11 BAM Task
NCETM: NC Assessment Materials (Teaching and Assessing Mastery)

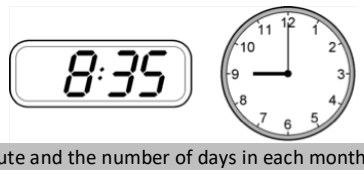
Possible misconceptions

- The use of IIII on a clock face suggests that a Roman numeral can be repeated four times, but this is a special case. In general, three is the maximum number of repeats and the subtractive method should be used instead (i.e. IV)
- Some pupils may think that all months have the same number of days.
- Some pupils do not have a realistic sense of the length of one minute (usually they count one, two, three … etc. far too quickly!)

Concrete

Pictorial

Abstract

PUMA assessment criteria			NCETM- Exemplification
Autumn	Spring	Summer	
Compare durations of events, for example to calculate the time taken by particular events or tasks. Record and compare time in terms of seconds, minutes, hours and o'clock; use vocabulary such as a.m./p.m., morning, afternoon, noon and midnight Tell and write the time from an analogue clock e.g. draw hands on a clock face to show 'ten to four', making sure the hour hand is located correctly	Compare durations of events, for example to calculate the time taken by particular events or tasks. Know the number of seconds in a minute and the number of days in each month, year and leap year Estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes, hours and o'clock; use vocabulary such as a.m./p.m., morning, afternoon, noon and midnight Tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour digital clocks	Compare durations of events, for example to calculate the time taken by particular events or tasks. estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes, hours and o'clock; use vocabulary such as a.m./p.m., morning, afternoon, noon and midnight Know the number of seconds in a minute and the number of days in each month, year and leap year tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour digital clocks	**tell and write the time from an analogue clock, including Roman numerals from I to XII, and 12-hour and 24-hour clocks How would this time appear on a 12-hour digital clock?** Children should be able to: ➢ Read times like this in analogue and digital formats, including those with Roman numerals.  ➢ Solve problems such as: Ben's clock says 7:50 when he gets up. Place the hands on this clock to show this time. **estimate and read time with increasing accuracy to the nearest minute, record and compare time in terms of seconds, minutes, hours and o'clock; use vocabulary such as a.m./p.m., morning, afternoon, noon and midnight** Children should be able to: ➢ Solve problems such as: o Kevin leaves home at quarter past 8 and arrives in school at 20 to 9. How long is his journey? How did you work this out? o How long is it between the times shown on these two clocks? How did you work it out?(oral question)  **know the number of seconds in a minute and the number of days in each month, year and leap year** Children should be able to: ➢ Solve problems such as: o Milly uses a stop-watch to time her cat eating its breakfast one morning. The reading on the stop-watch, once the cat had finished eating, says 135 seconds. Can you convert this into minutes and seconds? **compare durations of events, for example to calculate the time taken by particular events or tasks** Children should be able to: ➢ Solve problems such as: o Estimate how long your favourite TV programme lasts. Use a television guide to work out how close your estimation was. o It takes 35 minutes to walk from home to school. I need to be there by 8.55 am. What time do I need to leave home? o How much does it cost to hire a rowing boat for three hours? o Sasha pays £3.00 to hire a motor boat. She goes out at 3:20 pm. By what time must she return? Explain how you solved this problem. Could you have done it in a different way? o Sally and Maria both went to the gym on Saturday. Sally was there from 2 pm until 3.30pm. Maria was there from 12.30 pm until 3.15 pm. Who spent the longer time at the gym? How much longer was she there than her friend?  Boat Hire Motor boats £1.50 for 15 minutes Rowing boats £2.50 for 1 hour

Exploring fractions — *12 lessons*

Key concepts (National Curriculum statements)

The Big Picture: Fractions, decimals and percentages progression map

- recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators
- recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators
- recognise and show, using diagrams, equivalent fractions with small denominators
- compare and order unit fractions, and fractions with the same denominators

Notes and guidance (non-statutory)

- Pupils begin to understand unit and non-unit fractions as numbers on the number line, and deduce relations between them, such as size and equivalence. They should go beyond the [0, 1] interval, including relating this to measure.
- Pupils understand the relation between unit fractions as operators (fractions of), and division by integers.
- They continue to recognise fractions in the context of parts of a whole, numbers, measurements, a shape, and unit fractions as a division of a quantity.
- Pupils practise adding and subtracting fractions with the same denominator through a variety of increasingly complex problems to improve fluency.

Continuum References

Band 3 (R-WT)	Band 6 (1-WT)	Band 8 (1-AT)	Band 9 (2-WT)	Band 10 (2-AT)
N/A	Uses the concept and language of half / halves in practical situations eg. can give out 10 counters into 2 groups and recognises that 5 + 5 is fair and represents half equally	Recognises, finds and names a half as one of two equal parts of an object, shape or quantity. Recognises, finds and names a quarter as one of four equal parts of an object, shape or quantity.	Understands and can explain why parts in halves ad quarters have to be equal. Arranges objects in to four equal groups and explain, with some support, that each of them represents a quarter, and then additional quarters (e.g. 3 groups = ¾) Can also identify that 2 groups = ½ Works out 1/2 of 8 with supporting diagrams.	Recognises, finds, names and writes fractions 1/3, ¼, 2/4, and ¾ of a length, shape, set of objects or quantity Identifies three equal parts of a rectangle and know that each of them represents 1/3 Identifies four equal parts of a rectangle and know that two of them represent 2/4 and three of them represent 3/4. Recognises the equivalence of 2/4 and ½ . Counts in steps of 1/4, saying half rather than 2/4 and 1 1/2 instead of 6/4. Works out 1/2 of 8 = 4 and 1/3 of 6 = 2 using manipulatives or images as appropriate.
Band 4 (R-WT)				
N/A				
Band 5 (R-AT)	**Band 7 (1-WT)**			
Solves practical problems, involving the vocabulary and concepts of doubling, halving and sharing	Uses the concept and language of quarter / quarters in practical situations eg. can group 12 counters into four equal groups			

Possible themes

- Understand the meaning of a fraction
- Investigate the equivalence of fractions
- Compare fractions

Bring on the Maths⁺: Lower Key Stage 2
Fractions & decimals: Fractions as numbers

Possible key learning points

- Recognise a unit fraction of a set of objects
- Recognise a non-unit fraction of a set of objects
- Write a fraction of a set of objects
- Understand a unit fraction as a number
- Understand a non-unit fraction as a number
- Understand the concept of equivalent fractions
- Recognise equivalent fractions from diagrams
- Complete diagrams to show equivalent fractions
- Create diagrams to show equivalent fractions
- Compare a set of unit fractions
- Compare a set of fractions which have the same denominator

Prerequisites

- Recognise, find, name and write the fractions $^1/_3$, $^1/_4$, $^2/_4$ and $^3/_4$ of a length, shape, set of objects or quantity
- Write simple fraction statements; e.g. $^1/_2$ of 6 = 3
- Recognise the equivalence of $^2/_4$ and $^1/_2$

Mathematical language

Fraction
Unit fraction
Non-unit fraction
Numerator
Denominator
Equivalent (fraction)
Compare
Greater than, less than

Notation
Horizontal bar for fractions
Diagonal bar for fractions
Use of <, > and = symbols when comparing fractions

Pedagogical notes

Describe $^1/_3$ as 'there are three equal parts and I take one', and $^3/_4$ as 'there are four equal parts and I take three'. Also make the connection between $^3/_4$ and ' 3 of $^1/_4$ '
Be alert to pupils reinforcing misconceptions through language such as 'the bigger half'.
To explore the equivalency of fractions make several copies of a diagram with half shaded. Show that splitting these diagrams with varying numbers of lines does not alter the fraction of the shape that is shaded.
NCETM: Teaching fractions
NCETM: The Bar Model
NCETM: Glossary

Common approaches
In this unit, pupils work with denominators of at least 2 to 10.
Pupils are expected to use horizontal bar notation for fractions.

Reasoning opportunities and probing questions

- Show me a fraction. And another. And another.
- Which you would prefer, ½ of a cake, $^1/_3$ of a cake or ¼ of a cake?
- Convince me that $\frac{1}{2} = \frac{2}{4}$
- Show me a picture of $\frac{1}{5}$. And another. And another.

NCETM: Fractions Reasoning

Suggested activities

NRICH: Fraction Match
NRICH: Matching Fractions
NCETM: Activity F - Comparing Fractions

Learning review
KM: 3M8 BAM Task, 3M9 BAM Task
NCETM: NC Assessment Materials (Teaching and Assessing Mastery)

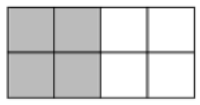
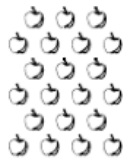
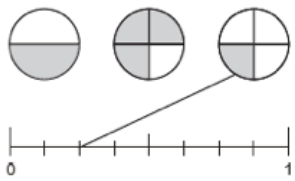
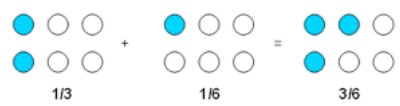
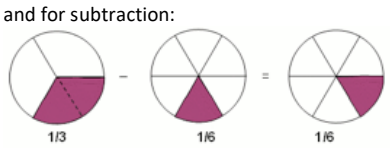
Possible misconceptions

- Some pupils may think that diagrams to show fractions must always be circular
- Some pupils may not acknowledge that the parts in a fraction must be equal; e.g. they talk about the 'bigger half'.
- Some pupils may not appreciate the fact that a non-unit fraction is a multiple of a unit fraction

Concrete

Pictorial

Abstract

PUMA assessment criteria			NCETM- Exemplification
Autumn	Spring	Summer	
Recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators e.g. find 1/3 of 9 beads, then 2/3 of 9 beads	Recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators e.g. there are 8 marbles and three of them are red; what fraction of the marbles are red?	Recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators e.g. find 4/5 of 30	recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators Children should be able to: ➢ Recognise and write unit and non-unit fractions of shapes. ➢ **Unit Fractions.** Unit means one. Here are some examples of unit fractions.  Can you spot the pattern? A unit fraction is one part of a whole that is divided into equal parts. ➢ **Non-unit fractions.** Unit means one, so non-unit is any number apart from one. Here are some examples of non-unit fractions.  Many (or, rather, more than one of the) parts, of an equally divided whole, is a non-unit fraction. Taken from: BBC skillswise different types of fraction ➢ Understand that the number on the bottom of a fraction tells me how many pieces the whole is divided into ➢ What fraction of this shape is shaded? How do you know? Is there another way that you can describe the fraction?  ➢ Find fractions of amounts o Here are 21 apples. Put a ring around one third of them.  recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators Children should be able to: ➢ Position fractions on a number line; eg. mark fractions such as ½, 3 ½ and 2 3/10 on a number line marked from zero to 5. ➢ A fraction of each shape is shaded. Match each fraction to the correct place on the number line. One has been done for you.  recognise and show, using diagrams, equivalent fractions with small denominators Children should be able to: ➢ Identify pairs of fractions that total 1. ➢ Circle two fractions that have the same value. ➢ add and subtract fractions with the same denominator within one whole (e.g. 5/7 + 1/7 = 6/7) ➢ This could also be done by using drawings and in the array form: For addition:  and for subtraction:  compare and order unit fractions, and fractions with the same denominators Children should be able to: ➢ Would you rather have 1/3 of 30 sweets or 1/5 of 40 sweets? Why?

Measuring space — 12 lessons

Key concepts (National Curriculum statements)

The Big Picture: Measurement and mensuration progression map

- measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml)
- measure the perimeter of simple 2-D shapes

Non Statuary guidance

- Pupils continue to measure using the appropriate tools and units, progressing to using a wider range of measures, including comparing and using mixed units (for example, 1 kg and 200g) and simple equivalents of mixed units (for example, 5m = 500cm).
- The comparison of measures includes simple scaling by integers (for example, a given quantity or measure is twice as long or 5 times as high) and this connects to multiplication.

Continuum References

Band 3 (R-WT)

✓ Compares the overall size of one object with that of another where the difference is not great

Band 4 (R-WT)

✓ Uses familiar words in practical situations when they compare sizes and quantities

Band 5 (R-AT)

✓ Compares objects directly, focusing on one dimension such as length or height and can indicate 'the long one' or 'the tall one'

Band 6 (1-WT)

✓ Shows which object is longer, shorter etc and use appropriate vocabulary in everyday situations

Band 7 (1-WT)

✓ Solves problems such as 'Using a balance, compare two boxes to find out which is heavier, heaviest'. Compare two 'snakes' which is longer, longest'

Band 8 (1-AT)

✓ Measures, records, compares, describes and solves practical problems for: lengths and heights, mass/weight, capacity and volume using non-standard measures.

Band 9 (2-WT)

✓ Chooses and uses an appropriate standard unit of measurement eg. selects a ruler marked in centimetres to measure the length of a pencil, minutes to measure time taken to do a task.

✓ Compares and orders measurements and record the results, by selecting from a set of measurements, pairs of measurements that satisfy conditions such as 'is less than', 'is greater than' and 'is the same as' and record them using symbols, with prompting.

Band 10 (2-AT)

✓ Chooses and uses appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels

✓ Compares and orders lengths, mass, volume/capacity and record the results using >, < and =

Possible themes

- Develop measurement skills
- Solve problems involving measurement
- Understand perimeter

Possible key learning points

- Use a ruler to measure lengths to the nearest millimetre
- Use a ruler to measure lengths to the nearest centimetre
- Use measuring equipment to measure lengths to the nearest metre
- Use digital and mechanical scales to measure mass to the nearest kg
- Use digital and mechanical scales to measure mass to the nearest g
- Use measuring vessels to measure a volume of liquid
- Choose appropriate units to state the result of a measurement
- Compare the length of two or more objects
- Compare the mass of two or more objects
- Compare the volume of two or more objects
- Compare the capacity of two or more objects
- Find the perimeter of a 2-D shape by measuring

Prerequisites

- Measure length using m, cm
- Measure mass using kg, g
- Measure volume / capacity using l, ml

Mathematical language

Length, distance
Mass
Volume
Capacity
Metre, centimetre, millimetre
Kilogram, gram
Litre, millilitre
Perimeter
2-D
Notation
Abbreviations of units in the metric system: m, cm, mm, kg, g, l, ml

Pedagogical notes

In this unit pupils should only measure perimeter; e.g. with string. Calculating perimeter is in Stage 4.
Weight and mass are distinct though they are often confused in everyday language. Weight is the force due to gravity, and is calculated as mass multiplied by the acceleration due to gravity. Therefore weight varies due to location while mass is a constant measurement.
The prefix 'centi-' means one hundredth, and the prefix 'milli-' means one thousandth. These words are of Latin origin.
The prefix 'kilo-' means one thousand. This is Greek in origin.
NCETM: Glossary
Common approaches
Every classroom has a sack of sand (25 kg), a bag of sugar (1 kg), a cheque book (1 cheque is 1 gram), a bottle of water (1 litre, and also 1 kg of water) and a teaspoon (5 ml)
Teachers ensure that pupils correctly position the '0' on the ruler when measuring the line.

Reasoning opportunities and probing questions

- Show me something in the classroom that is between 20 cm and 40 cm. And another. And another.
- Kenny measures two lines; 1 m and 35 cm. He says the difference is 650 mm. Do you agree with Kenny? Explain your answer.
- Convince me how to find the perimeter of a shape.
- Create a shape with a perimeter greater than 30 cm.

NCETM: Measurement Reasoning

Suggested activities

NRICH: Olympic Starters
NRICH: Car Journey
NCETM: Activity B - Perimeter
NCETM: Activity A - Measures
Learning review
KM: 3M12 BAM Task, 3M13 BAM Task
NCETM: NC Assessment Materials (Teaching and Assessing Mastery)

Possible misconceptions

- Some pupils may think that you put the end of the ruler (rather than the '0') at the start of a line to measure it.
- Some pupils may think that the conversion factor between all measures is multiply or divide by 10.
- Some pupils may think that milli- refers to 'million'

Concrete

Pictorial

Abstract

PUMA assessment criteria			NCETM- Exemplification
Autumn	Spring	Summer	Children should be able to: • Length: Show something that they think is just shorter/longer than a metre/centimetre/millimetre. They should be able to check whether they are right. • Mass: Say which object in the classroom is heavier than 100 g/kilogram/half-kilogram and know how to check if they are correct. • Capacity: Find a container that they think would hold one litre and check to find out if they were correct. • General: Say what each division on this scale is worth and explain how they worked this out. Read scales on practical equipment • Read times like this in analogue and digital formats, including those with Roman numerals. • Measure the sides of regular polygons in centimetres and millimetres and find their perimeters in centimetres and millimetres?
• Measure, compare, add and subtract: length (m/cm/mm) e.g. how much ribbon is left when 36cm is cut from 1m? Which is longer: 6½cm or 62mm? 5m or 450cm? Measure and draw lines to the nearest ½ cm. Know the approximate length of a book, a room, a handspan…	• Measure, compare, add and subtract: length (m/cm/mm) mass (kg/g) e.g. find 3 vegetables which weigh between 100g and 300g. Read 250g on a scale labelled every 100g. Which is heavier: 1kg 300g or 1½kg? Know the approximate mass of a book, an apple, a baby, a man…	• measure, compare, add and subtract: length (m/cm/mm); mass (kg/g); volume/capacity (l/ml) e.g. Read 300ml on a scale labelled every 200ml. Order a set of containers by capacity, using a measuring jug and water to check. Know the approximate capacity of a cup, a jug, a bucket… • measure the perimeter of simple 2-D shapes e.g. measure accurately the sides of a triangle in cm or mm, in order to find the perimeter	

Investigating angles — *8 lessons*

Key concepts (National Curriculum statements)

The Big Picture: Position and direction progression map

- recognise angles as a property of shape or a description of a turn
- identify right angles, recognise that two right angles make a half-turn, three make three quarters of a turn and four a complete turn; identify whether angles are greater than or less than a right angle

Notes and guidance (non-statutory)

- (They should be able to describe the properties of 2-D and 3-D shapes using accurate language, including lengths of lines) **and acute and obtuse for angles greater or lesser than a right angle**.

Continuum References

Band 3 (R-WT)	Band 6 (1-WT)	Band 8 (1-AT)	Band 9 (2-WT)	Band 10 (2-AT)
N/A	N/A	Describes direction and movement, including whole, half, quarter and three-quarter turns. Gives instructions to another including the turns either left or right, quarter turns either clockwise or anti-clockwise, referring to a clock face to establish the direction.	N/A	Use mathematical vocabulary to describe position, direction and movement, including movement in a straight line and distinguishing between rotation as a turn and in terms of right angles for quarter, half and three-quarter turns (clockwise and anti-clockwise).
Band 4 (R-WT)	**Band 7 (1-WT)**			
N/A	Follows instructions from another including the turns either left or right, quarter turns either clockwise or anti-clockwise, referring to a clock face to establish the direction, with prompts.			
Band 5 (R-AT)				
N/A				

Possible themes

- Explore angles and turning
- Compare angles

Bring on the Maths⁺: Lower Key Stage 2
Properties of Shapes: Turnings

Possible key learning points

- Understand that angle is a description of turn
- Understand that angles are a feature of shapes
- Identify a right angle as a quarter turn and when a shape has a right angle
- Recognise that two right angles make a half-turn
- Recognise that three right angles make three quarters of a turn
- Recognise that four right angles make a complete turn
- Identify angles that are less than right angle
- Identify angles that are greater than a right angle

Prerequisites

- Recognise and name the fractions $^1/_2$, $^1/_4$, $^2/_4$, $^3/_4$

Mathematical language

Half
Quarter
Three quarters
Angle
Turn
Right angle
Greater than, less than

Notation
Right angle notation

Pedagogical notes

Understanding degrees as a way of measuring angles is not introduced until Stage 5.
It is thought that the origin of the name 'right angle' is the Latin word for 'upright'; as in perpendicular to the horizontal base in architectural contexts.
NCETM: Glossary

Common approaches
All pupils experience the 'feel' of a right angle by turning through quarter turns

Reasoning opportunities and probing questions

- Show me a right angle in this classroom. And another. And another.
- Show me an angle in this classroom less (greater) than a right angle. And another. And another.
- Is this a right angle? Explain your answer.

- Convince me why this is not called a 'left' angle!

NCETM: Geometry - Properties of Shapes Reasoning

Suggested activities

NRICH: Square It
NCETM: Activity Set B
NCETM: Activity Set C

Learning review
NCETM: NC Assessment Materials (Teaching and Assessing Mastery)

Possible misconceptions

- Some pupils may think that right angles have to look like this:

- Some pupils may think that right angles have to be created from a horizontal and vertical line
- Some pupils may think that all turns have to be in a clockwise direction

Concrete

Pictorial

Abstract

PUMA assessment criteria			NCETM- Exemplification
Autumn	Spring	Summer	The requirements for Year 3 in Geometry: Properties of Shapes are quite explicit and exemplars are not particularly helpful. It is helpful, however, to understand that, in Year 3, pupils should be expected to demonstrate understanding in this area by: ➢ using appropriate mathematical vocabulary to describe the features of common 2-D and 3-D shapes including semicircles, hemispheres and prisms ➢ sorting and classifying collections of 2-D shapes in different ways using a range of properties including: 'all sides are of equal length,' 'has at least one right angle' or 'has at least one line of symmetry' ➢ recording their classifications on Venn and Carroll diagrams, including diagrams involving more than one criterion.
	Recognise that angles are a property of shape or a description of turn	Recognise that angles are a property of shape or a description of turn	

Calculating fractions and decimals — 8 lessons

Key concepts (National Curriculum statements)

The Big Picture: Fractions, decimals and percentages progression map

- count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10
- add and subtract fractions with the same denominator within one whole [for example, $^5/_7 + {}^1/_7 = {}^6/_7$]

Notes and guidance (non-statutory)

- Pupils connect tenths to place value, decimal measures and to division by 10.
- Pupils practise adding and subtracting fractions with the same denominator through a variety of increasingly complex problems to improve fluency.

Continuum References

Band 3 (R-WT)	Band 6 (1-WT)	Band 8 (1-AT)	Band 9 (2-WT)	Band 10 (2-AT)
N/A	Uses the concept and language of half / halves in practical situations eg. can give out 10 counters into 2 groups and recognises that 5 + 5 is fair and represents half equally	Recognises, finds and names a half as one of two equal parts of an object, shape or quantity. Recognises, finds and names a quarter as one of four equal parts of an object, shape or quantity.	Understands and can explain why parts in halves ad quarters have to be equal. Arranges objects in to four equal groups and explain, with some support, that each of them represents a quarter, and then additional quarters (e.g. 3 groups = ¾) Can also identify that 2 groups = ½ Works out 1/2 of 8 with supporting diagrams.	Recognises, finds, names and writes fractions 1/3, ¼, 2/4, and ¾ of a length, shape, set of objects or quantity Identifies three equal parts of a rectangle and know that each of them represents 1/3 Identifies four equal parts of a rectangle and know that two of them represent 2/4 and three of them represent 3/4. Recognises the equivalence of 2/4 and ½ . Counts in steps of 1/4, saying half rather than 2/4 and 1 1/2 instead of 6/4. Works out 1/2 of 8 = 4 and 1/3 of 6 = 2 using manipulatives or images as appropriate.
Band 4 (R-WT)				
N/A				
Band 5 (R-AT)	**Band 7 (1-WT)**			
Solves practical problems, involving the vocabulary and concepts of doubling, halving and sharing	Uses the concept and language of quarter / quarters in practical situations eg. can group 12 counters into four equal groups			

Possible themes

- Develop knowledge of place value
- Explore decimals
- Calculate with fractions

Bring on the Maths⁺: Lower Key Stage 2
Fractions & decimals: Counting in tenths

Possible key learning points

- Recognise that tenths arise from dividing a number or object into ten equal parts
- Write tenths as a fraction and as a decimal
- Count up in tenths
- Count down in tenths
- Add fractions with the same denominator within one whole
- Subtract fractions with the same denominator within one whole

Prerequisites

- Understand place value in numbers up to 1000
- Connect the ten times table to place value
- Recognise and write unit and non-unit fractions
- Understand unit and non-unit fractions as numbers on a number line

Mathematical language

Place value
Tenth
Decimal
Divide
Fraction
Unit fraction
Non-unit fraction
Numerator
Denominator
Add
Subtract

Notation
Decimal point
t notation for tenths
Horizontal bar for fractions
Diagonal bar for fractions

Pedagogical notes

Pupils will need to know the place value headings of tenths.
Some countries use a comma for a decimal point.
It is important to start at different numbers when counting up and down in tenths.
Counting should be practised as part of everyday practice: choral counting should not be restricted to this unit.
Pictorial representations of calculations involving the addition and subtraction facts are essential for pupils to understand why only the numerators are added or subtracted, not the denominators (e.g. '1 of 5 equal parts' add ' 2 of 5 equal parts' equals '3 of 5 equal parts')
NCETM: Teaching fractions
NCETM: Fractions videos
NCETM: Glossary

Common approaches
Pupils are expected to use horizontal bar notation for fractions
Teachers and pupils adopt the mantra: 'We say one fifth we think one of five equal parts; we say two fifths, we think two of five equal parts, etc'

Reasoning opportunities and probing questions

- Show me a decimal and fraction equivalent pair. And another. And another.
- Jenny is counting in tenths '…. 2.7, 2.8, 2.9, 2.10, 2.11 …'. Do you agree with Jenny? Explain your answer.
- Convince me that 6 ÷ 10 = 0.6
- Show me two fractions that add together to make a whole. And another pair. And another pair.
- Kenny thinks that $\frac{1}{4} + \frac{1}{4} = \frac{2}{8}$. Do you agree with Kenny? Explain your answer.
- Convince me how to subtract fractions.

NCETM: Fractions Reasoning

Suggested activities

NCETM: Activity A – visualising fractions along a line
NCETM: Activity E – adding fractions

Learning review
KM: 3M10 BAM Task
NCETM: NC Assessment Materials (Teaching and Assessing Mastery)

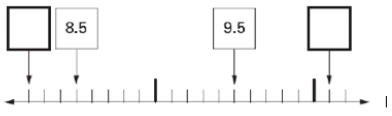
Possible misconceptions

- Some pupils may think that the first place value heading after the decimal point is 'one-ths' or 'unit-ths'
- Some pupils may think that you simply add the numerators and add the denominators when adding fractions.
- Some pupils may think that you simply subtract the numerators and subtract the denominators when subtracting fractions.
- Some pupils may move from 2.9 to 2.10 when counting in tenths
- Some pupils may read the number 2.10 as 'two point ten'

Concrete

Pictorial

Abstract

PUMA assessment criteria			NCETM- Exemplification
Autumn	Spring	Summer	Children should be able to: count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10 Children should be able to: ➢ Use decimal notation for tenths ➢ Divide single digits or whole numbers by 10 ➢ Explain how finding 1/10 is the same as dividing by 10 ➢ Here is part of a number line. Write in the numbers missing from the two empty boxes. 
Recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators e.g. find 1/3 of 9 beads, then 2/3 of 9 beads	Recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators e.g. there are 8 marbles and three of them are red; what fraction of the marbles are red?	Recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators e.g. find 4/5 of 30	

Exploring money — *8 lessons*

Key concepts (National Curriculum statements)

The Big Picture: Calculation progression map

- add and subtract amounts of money to give change, using both £ and p in practical contexts

Notes and guidance (non-statutory)

- Pupils continue to become fluent in recognising the value of coins, by adding and subtracting amounts, including mixed units, and giving change using manageable amounts. They record £ and p separately. The decimal recording of money is introduced formally in year 4.

Continuum References

Band 3 (R-WT)	Band 6 (1-WT)	Band 8 (1-AT)	Band 9 (2-WT)	Band 10 (2-AT)
N/A	N/A	Recognises and knows the value of different denominations of coins and notes in order to use to solve problems including giving change from £5	Assembles the coins to match an amount of money written using £ and p, with prompts in order to solve problems eg. *'It costs 50p to park a car for two hours. Show ways you can make up 50p using coins'.*	Recognises and uses symbols for pounds (£) and pence (p); combine amounts to make a particular value Finds different combinations of coins that equal the same amounts of money Solves simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change
Band 4 (R-WT)	**Band 7 (1-WT)**			
N/A	Identifies coins and order them according to their value.			
Band 5 (R-AT)				
N/A				

Possible themes

- Explore money
- Solve problems involving money

Possible key learning points

- Recognise the value of coins
- Add amounts of money when the units are the same
- Add amounts of money when the units are different
- Subtract amounts of money when the units are the same
- Subtract amounts of money when the units are different
- Record a practical money problem using £ and/or p notation
- Solve practical problems that involve calculating change in manageable amounts

Prerequisites

- Recognise the coins: 1p, 2p, 5p, 10p, 20p, 50p, £1 and £2
- Read and say amounts of money using the coins 1p, 2p, 5p, 10p, 20p, 50p, £1 and £2
- Count, say and record amounts of money using the coins 1p, 2p, 5p, 10p, 20p, 50p, £1 and £2
- Recognise the notes: £5 and £10
- Recognise the symbols for pounds (£) and pence (p)
- Record amounts of money using either pounds (£) or pence (p)
- Find different combinations of coins that equal the same amounts of money
- Solve simple problems involving money, including giving change

Mathematical language

Money
Coin
Change
Note

Notation
Pounds (£)
Pence (p)

Pedagogical notes

This unit focuses on pupils solving money problems in practical situations involving either pounds or pence. They are expected to be able to record the solution using £ or p notation.
Note: Decimal notation for money is not introduced formally until Stage 4.

NCETM: Glossary

Common approaches
£ **and** p are not used together to record an amount of money, for example £3.27 or 327p but not £3.27p

Reasoning opportunities and probing questions

- Kenny thinks that 'the larger the size of the coin, the greater the value of the coin'. Do you agree with Kenny?
- What is the same and what is different: *2p coin, 5p coin, 10p coin, 20p coin?*
- Jenny buys four items and pays with a £5 note. She gets three £1 coins and three 10p coins in her change. Convince me she could have paid for the four items using exactly five coins.
- Benny buys four items costing 10p, 50p, 10p and 5p. He pays with a £1 coin. He only expects to get one coin in his change. Do you agree with Benny? Explain your answer

Suggested activities

NRICH: Five Coins
NRICH: Money Bags
NRICH: The Puzzling Sweet Shop
NCETM: Activity C

Learning review
NCETM: NC Assessment Materials (Teaching and Assessing Mastery)

Possible misconceptions

- Some pupils may think that the larger the size of the coin, the greater the value of the coin, for example, a 2p coin is greater in value than a 5p coin.
- Some pupils may ignore the units in the first instance and simply add the numerical value of the coins, for example, 10p coin + £1 coin = 11p or £11
- Some pupils may try and use the £ and p notation together, such as £3p rather than £3 or 300p.

Concrete

Pictorial

Abstract

PUMA assessment criteria			NCETM- Exemplification
Autumn	Spring	Summer	add and subtract amounts of money to give change, using both £ and p in practical contexts Children should be able to: ➢ Solve problems like this: ○ Jake wants to buy a comic that costs £1. He saves 25p one week and 40p the next. How much more money does he need to buy the comic? ○ Add these prices: £6.73, £9.10 and £7.00 to find the total. Find out how much they need to add to get £23?
Add and subtract amounts of money to give change, using both £ and p in practical contexts e.g. I buy2 packs of sweets for 75p each; how much change will I get from £2?	Add and subtract amounts of money to give change, using both £ and p in practical contexts e.g. I have a £2 coin, two £1 coins, three 50p coins, a 20p and seven 5p coins; how much more do I need to make £10?	add and subtract amounts of money to give change, using both £ and p in practical contexts e.g. Ali is saving 80p each week, to buy a toy costing £5; how many weeks will it take him?	

Presentation of data — 8 lessons

Key concepts (National Curriculum statements)

The Big Picture: Statistics progression map

- interpret and present data using bar charts, pictograms and tables
- solve one-step and two-step questions [for example, 'How many more?' and 'How many fewer?'] using information presented in scaled bar charts and pictograms and tables

Notes and guidance (non-statutory)

- Pupils understand and use simple scales (for example, 2, 5, 10 units per cm) in pictograms and bar charts with increasing accuracy.
- They continue to interpret data presented in many contexts.

Continuum References

Band 3 (R-WT)	Band 5 (R-AT)	Band 7 (1-WT)	Band 9 (2-WT)	Band 10 (2-AT)
N/A	N/A	N/A	Answers simple questions from a tally chart or pictogram, with prompting Constructs a tally charts to show quantities Solves problems such as 'Which category has the most objects in it?' with support.	Interpret sand constructs simple pictograms, tally charts, block diagrams and simple tables Asks and answers simple questions by counting the number of objects in each category and sorting the categories by quantity Asks and answers questions about totalling and comparing categorical data.
Band 4 (R-WT)	**Band 6 (1-WT)**	**Band 8 (1-AT)**		
N/A	N/A	N/A		

Possible themes

- Explore ways to show data
- Solve problems involving charts and tables

Bring on the Maths+: Lower Key Stage 2

Statistics: Bar charts and pictograms

Possible key learning points

- Interpret a pictogram where the symbol represents multiple items
- Construct a pictogram where the symbol represents multiple items
- Interpret a bar chart
- Construct a bar chart
- Interpret data in a table
- Create a table to show data
- Answer one-step questions about data in charts and tables (e.g. 'How many?')
- Answer two-step questions about data in charts and tables (e.g. 'How many more?')

Prerequisites

- Interpret and construct block diagrams
- Interpret and construct pictograms where the symbol represents a single item or 2,5 and 10 units.
- Interpret and construct simple tables
- Understand tallying

Mathematical language

Data
Pictogram
Symbol
Key
Tally
Bar chart
Table
Total
Compare
Axis

Notation

When tallying, groups of five are created by striking through each group of four

Pedagogical notes

The bar chart was introduced by William Playfair, a Scottish economist, in 1786

Pupils are expected to understand and use simple scales, such as 2, 5, or 10 units per cm for bar charts and 2, 5, or 10 units per symbol for pictograms.

Note: The word 'data' is introduced in stage 3. It the plural of *datum*, from the Latin '*datum*' meaning "(thing) given,".

NCETM: Glossary

Common approaches

Pupils always construct or identify the key for a pictogram before doing anything else.

Reasoning opportunities and probing questions

- Show me a bar chart. And another. And another.
- Kenny thinks that a bar chart is the same as a block diagram. Do you agree with Kenny? Explain your answer.
- Jenny draws a bar chart with gaps between the bars. Lenny draws a bar chart with no gaps between the bars. Who is correct? Explain your answer.
- Penny draws a bar chart with horizontal bars. Benny says the bars must be vertical. Who is correct? Explain your answer.
- Always/Sometimes/Never**:** One centimetre on the frequency axis of a bar chart represents one unit.

NCETM: Statistics Reasoning

Suggested activities

KM: Make a 'Human' Bar Chart by asking pupils to stand on a giant set of axes.
KM: Stick on the Maths HD2: Bar charts and pictograms
NRICH: Class 5's Names
NRICH: Our Sports
NRICH: The Olympic Flame: Are You in the 95%?
NCETM: Activity A
NCETM: Activity B

Learning review

NCETM: NC Assessment Materials (Teaching and Assessing Mastery)

Possible misconceptions

- Some pupils may not leave gaps between the bars in a bar chart
- Some pupils may think that one centimetre on the frequency axis of a bar chart always represents one unit in a bar chart.
- Some pupils may think that a symbol always represents one unit in a pictogram.
- Some pupils may think that the bars of a bar chart must be vertical.

Concrete

Pictorial

Abstract

PUMA assessment criteria			NCETM- Exemplification
Autumn	Spring	Summer	interpret and present data using bar charts, pictograms and tables ➢ Process, present and interpret data to pose and answer questions. They use all representations such as Venn and Carroll diagrams, bar charts, pictograms. They collect data quickly onto a class tally chart. ➢ Children recognise that a tally involves grouping in fives and that this helps them to count the frequencies quickly and accurately. They produce a simple pictogram and/or bar chart, where a symbol represents 2 units. ➢ Children sort and classify objects, numbers or shapes according to two criteria, and display this work on Venn and Carroll diagrams. solve one-step and two-step questions such as 'How many more?' and 'How many fewer?' using information presented in scaled bar charts and pictograms and tables ➢ Collect, represent and interpret data in order to answer a question that is relevant to them, for example: o What new addition to the school play equipment would you like? o Which class race shall we choose for sports day? ➢ They decide on the information they need to collect and collect it efficiently. They collate the information on a tally chart or frequency table, then use this to make simple frequency diagrams such as bar charts, using ICT where appropriate. They discuss the outcomes, responding to questions such as: o Which items had fewer than five votes? o Would the table be the same if we asked Year 6? o How might the table change if everyone had two votes? ➢ Children present their conclusions to others, identifying key points that should be included. They make suggestions as to how this data could be used; for example, they may decide that they need to investigate the price of different equipment or discuss what they need to do to prepare for their chosen race.
Interpret and present data using bar charts, pictograms and tables, understanding and using simple scales e.g. 2, 5, 10 units per cm with increasing accuracy. Interpret data presented in many contexts Solve one-step and two-step questions such as 'How many more?' and 'How many fewer?' using information presented in scaled bar charts and pictograms and tables.	Interpret and present data using bar charts, pictograms and tables, understanding and using simple scales e.g. 2, 5, 10 units per cm with increasing accuracy. Interpret data presented in many contexts Solve one-step and two-step questions such as 'How many more?' and 'How many fewer?' using information presented in scaled bar charts and pictograms and tables.	Interpret and present data using bar charts, pictograms and tables, understanding and using simple scales e.g. 2, 5, 10 units per cm with increasing accuracy. Interpret data presented in many contexts Solve one-step and two-step questions such as 'How many more?' and 'How many fewer?' using information presented in scaled bar charts and pictograms and tables.	