

4.1 NUMBER SENSE

3-week sequence

Success criteria

Pupils can make appropriate decisions about when to use their understanding of counting, place value and rounding for solving problems including adding and subtracting.

I can explain and represent how I know that 7107 is greater than 7070, explain why it is easy to subtract 70 from 7070 and why rounding both numbers to the nearest hundred gives the same result, suggesting other numbers that would also round to 7100.

Learning objectives

Pupils should be taught to:

Number and place value

- count in multiples of 1000
- find 1000 more or less than a given number
- recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones)
- order and compare numbers beyond 1000
- identify, represent and estimate numbers using different representations
- round any number to the nearest 10, 100 or 1000

- solve number and practical problems that involve all of the above and with increasingly large positive numbers.

Guidance

Using a variety of representations, including measures, pupils become fluent in the order and place value of numbers beyond 1000, including counting in tens and hundreds, and maintaining fluency in other multiples through varied and frequent practice.

4.2 ADDITIVE REASONING

3-week sequence

Success criteria

Pupils can solve addition and subtraction problems in different contexts, appropriately choosing and using number facts, understanding of place value and counting and mental and written methods. They can explain their decision making and justify their solutions.

I can explain and represent different ways of solving $£677 + £549$ and $£1072 - £284$ and give reasons for which would be the most efficient.

Learning objectives

Pupils should be taught to:

Addition and subtraction

- add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate
- estimate and use inverse operations to check answers to a calculation
- solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why

Measurement

- estimate, compare and calculate different measures, including money in pounds and pence

Statistics

- interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs

- solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs.

Guidance

Pupils continue to practise both mental methods and columnar addition and subtraction with increasingly large numbers to aid fluency.

Pupils understand and use a greater range of scales in their representations.

For further guidance see appendix.

4.3 MULTIPLICATIVE REASONING

3-week sequence

Success criteria

Pupils can explain the relationship between multiplication and division and the distributive and associative laws. They use this understanding to derive facts and solve problems.

I can explain and represent how I use multiplication to help me solve $360 m \div 9$ and I can explain and represent different ways of solving $39 m \times 7$, and give reasons for which would be the most efficient. I can suggest contexts where these calculations might be necessary.

Learning objectives

Pupils should be taught to:

Number and place value

- count in multiples of 6, 7, 9, 25 and 1000

Multiplication and divisions

- recall multiplication and division facts for multiplication tables up to 12×12
- use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers
- recognise and use factor pairs and commutativity in mental calculations
- solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling and harder correspondence problems such as n objects are connected to m objects.

Guidance

Pupils continue to practise recalling and using multiplication tables and related division facts to aid fluency.

Pupils practise mental methods and extend this to three-digit numbers to derive facts, (for example, $600 \div 3 = 200$ can be derived from $2 \times 3 = 6$).

Pupils write statements about the equality of expressions (for example, use the distributive law $39 \times 7 = 30 \times 7 + 9 \times 7$ and associative law $(2 \times 3) \times 4 = 2 \times (3 \times 4)$). They combine their knowledge of number facts and rules of arithmetic to solve mental and written calculations for example, $2 \times 6 \times 5 = 10 \times 6 = 60$.

Pupils solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as the number of choices of a meal on a menu, or three cakes shared equally between 10 children.

4.4 GEOMETRIC REASONING

2-week sequence

Success criteria

Pupils can explain the properties of different triangles and quadrilaterals including angles and lines of symmetry.

I can sort a group of quadrilaterals to identify those which have lines of symmetry that cross at right angles.

Learning objectives

Pupils should be taught to:

Geometry: properties of shape

- compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes
- identify acute and obtuse angles and compare and order angles up to two right angles by size
- identify lines of symmetry in 2-D shapes presented in different orientations.

Guidance

Pupils continue to classify shapes using geometrical properties, extending to classifying different triangles (for example, isosceles, equilateral, scalene) and quadrilaterals (for example, parallelogram, rhombus, trapezium).

Pupils compare and order angles in preparation for using a protractor and compare lengths and angles to decide if a polygon is regular or irregular.

4.5 NUMBER SENSE

2-week sequence

Success criteria

Pupils can make appropriate decisions about when to use their understanding of counting (including counting below zero), place value and rounding for solving problems including adding and subtracting. Pupils can explain the representation of two-digit positive numbers as Roman numerals.

I can explain and represent how I know that 97 is greater than -97 and explain why it is easier to subtract 7 from 97 than -97 . I can explain how to represent 97 in Roman numerals and why this is not possible for -97 .

Learning objectives

Pupils should be taught to:

Number and place value

- count in multiples of 1000
- find 1000 more or less than a given number
- count backwards through zero to include negative numbers
- recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones)
- order and compare numbers beyond 1000
- identify, represent and estimate numbers using different representations
- round any number to the nearest 10, 100 or 1000
- solve number and practical problems that involve all of the above and with increasingly large positive numbers

- read Roman numerals to 100 (I to C) and know that, over time, the numeral system changed to include the concept of zero and place value.

Guidance

Using a variety of representations, including measures, pupils become fluent in the order and place value of numbers beyond 1000, including counting in tens and hundreds, and maintaining fluency in other multiples through varied and frequent practice.

Roman numerals should be put in their historical context so pupils understand that there have been different ways to write whole numbers and that the important concepts of zero and place value were introduced over a period of time.

4.6 ADDITIVE REASONING

3-week sequence

Success criteria

Pupils can solve addition and subtraction problems in different contexts, appropriately choosing and using number facts, understanding of place value and counting and mental and written methods. They can explain their decision making and justify their solutions.

I can explain and represent different ways of solving $5678 \text{ km} + 456 \text{ km}$ and $9045 \text{ km} - 654 \text{ km}$ and give reasons for which would be the most efficient. I can suggest contexts where these calculations might be necessary.

Learning objectives

Pupils should be taught to:

Addition and subtraction

- add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate
- estimate and use inverse operations to check answers to a calculation
- solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why

Measurement

- estimate, compare and calculate different measures, including money in pounds and pence

Statistics

- interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs
- solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs.

Guidance

Pupils continue to practise both mental methods and columnar addition and subtraction with increasingly large numbers to aid fluency.

Pupils understand and use a greater range of scales in their representations.

For further guidance see appendix.

4.7 NUMBER SENSE

3-week sequence

Success criteria

Pupils can represent and explain the multiplicative nature of the number system including how it extends into decimal numbers, as whole numbers are divided by 10 or 100 and connect this understanding to units of measure. Pupils can represent and explain the relationship between decimals and fractions. They use this understanding to solve problems.

I can represent and explain how $\frac{1}{2}$ is equivalent to 0.5, $\frac{5}{10}$, $\frac{50}{100}$ and $5 \div 10$. I can explain which of 3.4 litres and 2987 ml is the greater quantity and explain why rounding both capacities to the nearest litre gives the same result.

Learning objectives

Pupils should be taught to:

Fractions (including decimals)

- count up and down in hundredths; recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten
- recognise and show, using diagrams, families of common equivalent fractions
- add and subtract fractions with the same denominator
- recognise and write decimal equivalents of any number of tenths or hundredths
- recognise and write decimal equivalents to $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$
- find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths
- round decimals with one decimal place to the nearest whole number
- compare numbers with the same number of decimal places up to two decimal places

Measurement

- convert between different units of measure [for example, kilometre to metre].

Guidance

Pupils are taught throughout that decimals and fractions are different ways of expressing numbers and proportions.

Pupils make connections between fractions of a length, of a shape and as a representation of one whole or set of quantities. Pupils use factors and multiples to recognize equivalent fractions and simplify where appropriate (for example, $\frac{2}{4} = \frac{1}{2}$, or $\frac{1}{4} = \frac{2}{8}$). They practise counting using simple fractions and decimals, both forwards and backwards.

For further guidance see appendix.

4.8 MULTIPLICATIVE REASONING

3-week sequence

Success criteria

Pupils can explain the relationship between multiplication, division and fractions. They use this understanding to derive facts and solve problems.

I can explain and represent how many different sandwiches can be made with three types of bread and five types of fillings, how many bags of crisps are salt and vinegar in a box of 100 if they form $\frac{3}{5}$ of the box and what happens if you share four bars of chocolate fairly between seven people.

Learning objectives

Pupils should be taught to:

Number and place value

- count in multiples of 6, 7, 9, 25 and 1000

Multiplication and division

- recall multiplication and division facts for multiplication tables up to 12×12
- use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers
- recognise and use factor pairs and commutativity in mental calculations
- solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling and harder correspondence problems such as n objects are connected to m objects

Fractions (including decimals)

- solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number

Measurement

- solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days.

Guidance

Pupils understand the relation between non-unit fractions and multiplication and division of quantities, with particular emphasis on tenths and hundredths.

For further guidance see 4.3.

4.9 GEOMETRIC REASONING

2-week sequence

Success criteria

Pupils can explain how to locate points on a grid in the first quadrant and use this knowledge and understanding to solve problems.

I can identify the coordinates (4, 2) and (4, 4) when marked on a grid, plot and identify two more points to form a square and explain what happens to the coordinates of the vertices of the square if it is translated two squares to the right and one square up.

Learning objectives

Pupils should be taught to:

Geometry: properties of shapes

- compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes

Geometry: position and direction

- describe positions on a 2-D grid as coordinates in the first quadrant
- describe movements between positions as translations of a given unit to the left / right and up / down
- plot specified points and draw sides to complete a given polygon.

Guidance

Pupils continue to classify shapes using geometrical properties, extending to classifying different triangles (for example, isosceles, equilateral, scalene) and quadrilaterals (for example, parallelogram, rhombus, trapezium).

Pupils compare and order angles in preparation for using a protractor and compare lengths and angles to decide if a polygon is regular or irregular.

Pupils draw a pair of axes in one quadrant, with equal scales and integer labels. They read, write and use pairs of coordinates (for example, 2, 5), including using coordinate-plotting ICT tools.

4.10 NUMBER SENSE

2-week sequence

Success criteria

Pupils can make appropriate decisions about when to use their understanding of counting (including counting below zero), place value and rounding for solving problems including adding and subtracting. They can explain how to tell the time in both 12- and 24-hour clocks and can solve problems using their understanding of how to convert between different units of time.

I can explain and show how I know what time I would need to arrive at St. Pancras train station in order to catch the train to Paris if I have to check in 30 minutes before the train leaves, for a range of departure times in a table. I can say what the time will be in an hour and a quarter, 120 seconds and 90 minutes in both 12- and 24-hour clocks.

Learning objectives

Pupils should be taught to:

Number and place value

- count in multiples of 1000
- find 1000 more or less than a given number
- count backwards through zero to include negative numbers
- recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones)
- order and compare numbers beyond 1000
- identify, represent and estimate numbers using different representations
- round any number to the nearest 10, 100 or 1000
- solve number and practical problems that involve all of the above and with increasingly large positive numbers

Measurement

- convert between different units of measure [for example, hour to minute]
- read, write and convert time between analogue and digital 12- and 24-hour clocks

- solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days

Statistics

- solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs.

Guidance

Using a variety of representations, including measures, pupils become fluent in the order and place value of numbers beyond 1000, including counting in tens and hundreds, and maintaining fluency in other multiples through varied and frequent practice.

Pupils use multiplication to convert from larger to smaller units.

4.11 ADDITIVE REASONING

3-week sequence

Success criteria

Pupils can solve addition and subtraction problems in different contexts, appropriately choosing and using number facts, understanding of place value and counting and mental and written methods. They explain their decision making and justify their solutions.

I can use information from population tables for my local town to explain how the town has changed in size at different points in time.

Learning objectives

Pupils should be taught to:

Addition and subtraction

- add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate
- estimate and use inverse operations to check answers to a calculation
- solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why

Statistics

- interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs

- solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs

Fractions (including decimals)

- solve simple measure and money problems involving fractions and decimals to two decimal places

Measurement

- estimate, compare and calculate different measures, including money in pounds and pence

Guidance

Pupils build on their understanding of place value and decimal notation to record metric measures, including money.

For further guidance see 4.2 and appendix.

4.12 NUMBER SENSE

2-week sequence

Success criteria

Pupils can represent and explain how the multiplicative nature of the number system extends into decimal numbers, as whole numbers are divided by 10 or 100, and connect this understanding to units of measure. Pupils can represent and explain the relationship between decimals and fractions. They use this understanding to solve problems.

I can represent and explain how $\frac{3}{4}$ is equivalent to 0.75, $\frac{75}{100}$ and $75 \div 100$. I can say which of 4.3 kg and 3520 g is the greater weight and explain why rounding both weights to the nearest kg gives the same result.

Learning objectives

Pupils should be taught to:

Fractions (including decimals)

- count up and down in hundredths; recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten
- recognise and show, using diagrams, families of common equivalent fractions
- add and subtract fractions with the same denominator
- recognise and write decimal equivalents of any number of tenths or hundredths
- recognise and write decimal equivalents to $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$.
- find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths
- round decimals with one decimal place to the nearest whole number
- compare numbers with the same number of decimal places up to two decimal places

Measurement

- convert between different units of measure [for example, kilometre to metre).

Guidance

Pupils are taught throughout that decimals and fractions are different ways of expressing numbers and proportions.

Pupils' understanding of the number system and decimal place value is extended at this stage to tenths and then hundredths. This includes relating the decimal notation to division of whole numbers by 10 and later 100.

They make comparisons and order decimal amounts and quantities that are expressed to the same number of decimal places. They should be able to represent numbers with one or two decimal places in several ways, such as on number lines.

They extend the use of the number line to connect fractions, numbers and measures.

For additional guidance see 4.7 and appendix.

4.13 MULTIPLICATIVE REASONING

3-week sequence

Success criteria

Pupils can solve problems involving multiplication, division and fractions in different contexts, appropriately choosing and using number facts, understanding of place value and counting and mental and written methods, explain their decision making and justify their solutions.

I can explain and represent different ways of solving "Daniel is celebrating his ninth birthday. His Gran has been saving £3 for him every month since he was born. How much money has she saved?" and give reasons for which would be the most efficient. I can explain and represent different ways of solving "Daniel is going on holiday in 98 days. How many weeks is it until he leaves?" and give reasons for which would be the most efficient.

Learning objectives

Pupils should be taught to:

Number and place value

- count in multiples of 6, 7, 9, 25 and 1000

Multiplication and division

- recall multiplication and division facts for multiplication tables up to 12×12
- use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers
- recognise and use factor pairs and commutativity in mental calculations
- multiply two-digit and three-digit numbers by a one-digit number using formal written layout

- solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling and harder correspondence problems such as n objects are connected to m objects.

Fractions (including decimals)

- solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number

Measurement

- solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days.

Guidance

For guidance see 4.3 and 4.8.

4.14 GEOMETRIC REASONING

2-week sequence

Success criteria

Pupils can explain how to find the perimeter and area of a shape and how to complete a symmetrical shape with a given line of symmetry, using this knowledge and understanding to solve problems.

I can explain and represent how 12 square paving slabs can be used to make patios with different perimeters. I can find which vegetable patch with a perimeter of 16 m has the biggest area and explain why it has the biggest area. I can complete a pixelated picture of a house with one line of symmetry.

Learning objectives

Pupils should be taught to:

Geometry: properties of shapes

- compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes
- identify acute and obtuse angles and compare and order angles up to two right angles by size
- identify lines of symmetry in 2-D shapes presented in different orientations
- complete a simple symmetric figure with respect to a specific line of symmetry

Measurement

- measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres
- find the area of rectilinear shapes by counting squares.

Guidance

Pupils draw symmetric patterns using a variety of media to become familiar with different orientations of lines of symmetry; and recognise line symmetry in a variety of diagrams, including where the line of symmetry does not dissect the original shape.

Perimeter can be expressed algebraically as $2(a + b)$ where a and b are the dimensions in the same unit.

They relate area to arrays and multiplication.

For further guidance see 4.4.