

Stage 5

It is important that learners become confident users of calculators. They need to recognise that the calculator is a tool of which they are in control and to understand how it can help them to develop their mathematics. Learners can be taught how to use a calculator effectively and to recognise how and when it is appropriate to do so; by first deciding if mental and pencil-and-paper methods are quicker or more reliable. Note that to use a calculator effectively requires a secure knowledge of number, which has to be the prime aim.

Number

Numbers and the number system

- Count on and back in steps of constant size, extending beyond zero.
- Know what each digit represents in five- and six-digit numbers.
- Partition any number up to one million into thousands, hundreds, tens and units.
- Use decimal notation for tenths and hundredths and understand what each digit represents.
- Multiply and divide any number from 1 to 10 000 by 10 or 100 and understand the effect.
- Round four-digit numbers to the nearest 10, 100 or 1000.
- Round a number with one or two decimal places to the nearest whole number.
- Order and compare numbers up to a million using the $>$ and $<$ signs.

- Order and compare negative and positive numbers on a number line and temperature scale.
- Calculate a rise or fall in temperature.
- Order numbers with one or two decimal places and compare using the $>$ and $<$ signs.
- Recognise and extend number sequences.
- Recognise odd and even numbers and multiples of 5, 10, 25, 50 and 100 up to 1000.
- Make general statements about sums, differences and multiples of odd and even numbers.
- Recognise equivalence between: $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{1}{8}$; $\frac{1}{3}$ and $\frac{1}{6}$; $\frac{1}{5}$ and $\frac{1}{10}$.
- Recognise equivalence between the decimal and fraction forms of halves, tenths and hundredths and use this to help order fractions, e.g. 0.6 is more than 50% and less than $\frac{7}{10}$.
- Change an improper fraction to a mixed number, e.g. $\frac{7}{4}$ to $1\frac{3}{4}$; order mixed numbers and place between whole numbers on a number line.
- Relate finding fractions to division and use to find simple fractions of quantities.
- Understand percentage as the number of parts in every 100 and find simple percentages of quantities.
- Express halves, tenths and hundredths as percentages.

Stage 5

Number (continued)

Numbers and the number system (continued)

- Use fractions to describe and estimate a simple proportion, e.g. $\frac{1}{5}$ of the beads are yellow.
- Use ratio to solve problems, e.g. to adapt a recipe for 6 people to one for 3 or 12 people.

Calculation

Mental strategies

- Know by heart pairs of one-place decimals with a total of 1, e.g. $0.8 + 0.2$.
- Derive quickly pairs of decimals with a total of 10, and with a total of 1.
- Know multiplication and division facts for the $2\times$ to $10\times$ tables.
- Know and apply tests of divisibility by 2, 5, 10 and 100.
- Recognise multiples of 6, 7, 8 and 9 up to the 10th multiple.
- Know squares of all numbers to 10×10 .
- Find factors of two-digit numbers.
- Count on or back in thousands, hundreds, tens and ones to add or subtract.
- Add or subtract near multiples of 10 or 100, e.g. $4387 - 299$.

- Use appropriate strategies to add or subtract pairs of two- and three-digit numbers and number with one decimal place, using jottings where necessary.
- Calculate differences between near multiples of 1000, e.g. $5026 - 4998$, or near multiples of 1, e.g. $3.2 - 2.6$.
- Multiply multiples of 10 to 90, and multiples of 100 to 900, by a single-digit number.
- Multiply by 19 or 21 by multiplying by 20 and adjusting.
- Multiply by 25 by multiplying by 100 and dividing by 4.
- Use factors to multiply, e.g. multiply by 3, then double to multiply by 6.
- Double any number up to 100 and halve even numbers to 200 and use this to double and halve numbers with one or two decimal places, e.g. double 3.4 and half of 8.6.
- Double multiples of 10 to 1000 and multiples of 100 to 10000, e.g. double 360 or double 3600, and derive the corresponding halves.

Addition and subtraction

- Find the total of more than three two- or three-digit numbers using a written method.
- Add or subtract any pair of three- and/or four-digit numbers, with the same number of decimal places, including amounts of money.

Stage 5

Number (continued)

Calculation (continued)

Multiplication and division

- Multiply or divide three-digit numbers by single-digit numbers.
- Multiply two-digit numbers by two-digit numbers.
- Multiply two-digit numbers with one decimal place by single-digit numbers, e.g. 3.6×7 .
- Divide three-digit numbers by single-digit numbers, including those with a remainder (answers no greater than 30).
- Start expressing remainders as a fraction of the divisor when dividing two-digit numbers by single-digit numbers.
- Decide whether to group (using multiplication facts and multiples of the divisor) or to share (halving and quartering) to solve divisions.
- Decide whether to round an answer up or down after division, depending on the context.
- Begin to use brackets to order operations and understand the relationship between the four operations and how the laws of arithmetic apply to multiplication.

Geometry

Shapes and geometric reasoning

- Identify and describe properties of triangles and classify as isosceles, equilateral or scalene.
- Recognise reflective and rotational symmetry in regular polygons.
- Create patterns with two lines of symmetry, e.g. on a pegboard or squared paper.
- Visualise 3D shapes from 2D drawings and nets, e.g. different nets of an open or closed cube.
- Recognise perpendicular and parallel lines in 2D shapes, drawings and the environment.
- Understand and use angle measure in degrees; measure angles to the nearest 5° ; identify, describe and estimate the size of angles and classify them as acute, right or obtuse.
- Calculate angles in a straight line.

Position and movement

- Read and plot co-ordinates in the first quadrant.
- Predict where a polygon will be after reflection where the mirror line is parallel to one of the sides, including where the line is oblique.
- Understand translation as movement along a straight line, identify where polygons will be after a translation and give instructions for translating shapes.

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Measure

Length, mass and capacity

- Read, choose, use and record standard units to estimate and measure length, mass and capacity to a suitable degree of accuracy.
- Convert larger to smaller metric units (decimals to one place), e.g. change 2.6 kg to 2600 g.
- Order measurements in mixed units.
- Round measurements to the nearest whole unit.
- Interpret a reading that lies between two unnumbered divisions on a scale.
- Compare readings on different scales.
- Draw and measure lines to the nearest centimetre and millimetre.

Time

- Recognise and use the units for time (seconds, minutes, hours, days, months and years).
- Tell and compare the time using digital and analogue clocks using the 24-hour clock.
- Read timetables using the 24-hour clock.
- Calculate time intervals in seconds, minutes and hours using digital or analogue formats.
- Use a calendar to calculate time intervals in days and weeks (using knowledge of days in calendar months).
- Calculate time intervals in months or years.

Area and perimeter

- Measure and calculate the perimeter of regular and irregular polygons.
- Understand area measured in square centimetres (cm²).
- Use the formula for the area of a rectangle to calculate the rectangle's area.

Stage 5

Handling data

Organising, categorising and representing data

- Answer a set of related questions by collecting, selecting and organising relevant data; draw conclusions from their own and others' data and identify further questions to ask.
- Draw and interpret frequency tables, pictograms and bar line charts, with the vertical axis labelled for example in twos, fives, tens, twenties or hundreds. Consider the effect of changing the scale on the vertical axis.
- Construct simple line graphs, e.g. to show changes in temperature over time.
- Understand where intermediate points have and do not have meaning, e.g. comparing a line graph of temperature against time with a graph of class attendance for each day of the week.
- Find and interpret the mode of a set of data.

Probability

- Describe the occurrence of familiar events using the language of chance or likelihood.

Problem solving

Using techniques and skills in solving mathematical problems

- Understand everyday systems of measurement in length, weight, capacity, temperature and time and use these to perform simple calculations.
- Solve single and multi-step word problems (all four operations); represent them, e.g. with diagrams or a number line.
- Check with a different order when adding several numbers or by using the inverse when adding or subtracting a pair of numbers.
- Use multiplication to check the result of a division, e.g. multiply 3.7×8 to check $29.6 \div 8$.
- Recognise the relationships between different 2D and 3D shapes, e.g. a face of a cube is a square.
- Estimate and approximate when calculating, e.g. using rounding, and check working.
- Consider whether an answer is reasonable in the context of a problem.

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Problem solving (continued)

Using understanding and strategies in solving problems

- Understand everyday systems of measurement in length, weight, capacity, temperature and time and use these to perform simple calculations.
- Choose an appropriate strategy for a calculation and explain how they worked out the answer.
- Explore and solve number problems and puzzles, e.g. logic problems.
- Deduce new information from existing information to solve problems.
- Use ordered lists and tables to help to solve problems systematically.
- Describe and continue number sequences, e.g. $-30, -27, \square, \square, -18, \dots$; identify the relationships between numbers.
- Identify simple relationships between shapes, e.g. these triangles are all isosceles because ...
- Investigate a simple general statement by finding examples which do or do not satisfy it, e.g. the sum of three consecutive whole numbers is always a multiple of three.
- Explain methods and justify reasoning orally and in writing; make hypotheses and test them out.
- Solve a larger problem by breaking it down into sub-problems or represent it using diagrams.

