

Stage 6

As in 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 fractions and decimals, e.g. $\frac{1}{3}$ s, 0.1s, and repeated steps of whole numbers (and through zero).
- Know what each digit represents in whole numbers up to a million.
- Know what each digit represents in one- and two-place decimal numbers.
- Multiply and divide any whole number from 1 to 10 000 by 10, 100 or 1000 and explain the effect.
- Multiply and divide decimals by 10 or 100 (answers up to two decimal places for division).
- Find factors of two-digit numbers.
- Find some common multiples, e.g. for 4 and 5.
- Round whole numbers to the nearest 10, 100 or 1000.
- Round a number with two decimal places to the nearest tenth or to the nearest whole number.
- Make and justify estimates and approximations of large numbers.
- Order and compare positive numbers to one million, and negative integers to an appropriate level.
- Use the $>$, $<$ and $=$ signs correctly.
- Estimate where four-digit numbers lie on an empty 0–10 000 line.
- Order numbers with up to two decimal places (including different numbers of places).
- Recognise and extend number sequences.
- Recognise and use decimals with up to three places in the context of measurement.
- 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 prime numbers up to 20 and find all prime numbers less than 100.
- Recognise the historical origins of our number system and begin to understand how it developed.
- Compare fractions with the same denominator and related denominators, e.g. $\frac{3}{4}$ with $\frac{7}{8}$.

Stage 6

Number (continued)

Numbers and the number system (continued)

- Recognise equivalence between fractions, e.g. between $\frac{1}{100}s$, $\frac{1}{10}s$ and $\frac{1}{2}s$.
- Recognise and use the equivalence between decimal and fraction forms.
- Order mixed numbers and place between whole numbers on a number line.
- Change an improper fraction to a mixed number, e.g. $\frac{17}{8}$ to $2\frac{1}{8}$.
- Reduce fractions to their simplest form, where this is $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ or a number of fifths or tenths.
- Begin to convert a vulgar fraction to a decimal fraction using division.
- Understand percentage as parts in every 100 and express $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{10}$, $\frac{1}{100}$ as percentages.
- Find simple percentages of shapes and whole numbers.
- Solve simple problems involving ratio and direct proportion.

Calculation

Mental strategies

- Recall addition and subtraction facts for numbers to 20 and pairs of one-place decimals with a total of 1, e.g. $0.4 + 0.6$.
- Derive quickly pairs of one-place decimals totalling 10, e.g. 7.8 and 2.2, and two-place decimals totalling 1, e.g. $0.78 + 0.22$.
- Know and apply tests of divisibility by 2, 4, 5, 10, 25 and 100.
- Use place value and number facts to add or subtract two-digit whole numbers and to add or subtract three-digit multiples of 10 and pairs of decimals, e.g. $560 + 270$; $2.6 + 2.7$; $0.78 + 0.23$.
- Add/subtract near multiples of one when adding numbers with one decimal place, e.g. $5.6 + 2.9$; $13.5 - 2.1$.
- Add/subtract a near multiple of 10, 100 or 1000, or a near whole unit of money, and adjust, e.g. $3127 + 4998$; $5678 - 1996$.
- Use place value and multiplication facts to multiply/divide mentally, e.g. 0.8×7 ; $4.8 \div 6$.
- Multiply pairs of multiples of 10, e.g. 30×40 , or multiples of 10 and 100, e.g. 600×40 .
- Double quickly any two-digit number, e.g. 78, 7.8, 0.78 and derive the corresponding halves.
- Divide two-digit numbers by single-digit numbers, including leaving a remainder.

Addition and subtraction

- Add two- and three-digit numbers with the same or different numbers of digits/decimal places.
- Add or subtract numbers with the same and different numbers of decimal places, including amounts of money.
- Find the difference between a positive and negative integer, and between two negative integers in a context such as temperature or on a number line.

Number (continued)

Calculation (continued)

Multiplication and division

- Multiply pairs of multiples of 10, e.g. 30×40 , or multiples of 10 and 100, e.g. 600×40 .
- Multiply near multiples of 10 by multiplying by the multiple of 10 and adjusting.
- Multiply by halving one number and doubling the other, e.g. calculate 35×16 with 70×8 .
- Use number facts to generate new multiplication facts, e.g. the $17 \times$ table from $10 \times + 7 \times$ tables.
- Multiply two-, three- or four-digit numbers (including sums of money) by a single-digit number and two- or three-digit numbers by two-digit numbers.
- Divide three-digit numbers by single-digit numbers, including those leaving a remainder and divide three-digit numbers by two-digit numbers (no remainder) including sums of money.
- Give an answer to division as a mixed number, and a decimal (with divisors of 2, 4, 5, 10 or 100).
- Relate finding fractions to division and use them as operators to find fractions including several tenths and hundredths of quantities.
- Know and apply the arithmetic laws as they apply to multiplication (without necessarily using the terms commutative, associative or distributive).

Geometry

Shapes and geometric reasoning

- Classify different polygons and understand whether a 2D shape is a polygon or not.
- Visualise and describe the properties of 3D shapes, e.g. faces, edges and vertices.
- Identify and describe properties of quadrilaterals (including the parallelogram, rhombus and trapezium), and classify using parallel sides, equal sides, equal angles.
- Recognise and make 2D representations of 3D shapes including nets.
- Estimate, recognise and draw acute and obtuse angles and use a protractor to measure to the nearest degree.
- Check that the sum of the angles in a triangle is 180° , for example, by measuring or paper folding; calculate angles in a triangle or around a point.

Position and movement

- Read and plot co-ordinates in all four quadrants.
- Predict where a polygon will be after one reflection, where the sides of the shape are not parallel or perpendicular to the mirror line, after one translation or after a rotation through 90° about one of its vertices.

Stage 6

Measure

Length, mass and capacity

- Select and use standard units of measure. Read and write to two or three decimal places.
- Convert between units of measurement (kg and g, l and ml, km, m, cm and mm), using decimals to three places, e.g. recognising that 1.245 m is 1 m 24.5 cm.
- Interpret readings on different scales, using a range of measuring instruments.
- Draw and measure lines to the nearest centimetre and millimetre.
- Know imperial units still in common use, e.g. the mile, and approximate metric equivalents.

Time

- Recognise and understand the units for measuring time (seconds, minutes, hours, days, weeks, months, years, decades and centuries); convert one unit of time into another.
- Tell the time using digital and analogue clocks using the 24-hour clock.
- Compare times on digital and analogue clocks, e.g. realise quarter to four is later than 3:40.
- Read and use timetables using the 24-hour clock.
- Calculate time intervals using digital and analogue times.

- Use a calendar to calculate time intervals in days, weeks or months.
- Calculate time intervals in days, months or years.
- Appreciate how the time is different in different time zones around the world.

Area and perimeter

- Measure and calculate the perimeter and area of rectilinear shapes.
- Estimate the area of an irregular shape by counting squares.
- Calculate perimeter and area of simple compound shapes that can be split into rectangles.

Handling data

Organising, categorising and representing data

- Solve a problem by representing, extracting and interpreting data in tables, graphs, charts and diagrams, e.g. line graphs for distance and time; a price 'ready-reckoner' for currency conversion; frequency tables and bar charts with grouped discrete data.
- Find the mode and range of a set of data from relevant situations, e.g. scientific experiments.
- Begin to find the median and mean of a set of data.
- Explore how statistics are used in everyday life.

Handling data (continued)

Probability

- Use the language associated with probability to discuss events, to assess likelihood and risk, including those with equally likely outcomes.

Problem solving

Using techniques and skills in solving mathematical problems

- Choose appropriate and efficient mental or written strategies to carry out a calculation involving addition, subtraction, multiplication or division.
- Understand everyday systems of measurement in length, weight, capacity, temperature and time and use these to perform simple calculations.
- Check addition with a different order when adding a long list of numbers; check when subtracting by using the inverse.
- Recognise 2D and 3D shapes and their relationships, e.g. a cuboid has a rectangular cross-section.
- Estimate and approximate when calculating, e.g. use rounding, and check working.

Using understanding and strategies in solving problems

- Explain why they chose a particular method to perform a calculation and show working.
- Deduce new information from existing information and realise the effect that one piece of information has on another.
- Use logical reasoning to explore and solve number problems and mathematical puzzles.
- Use ordered lists or tables to help solve problems systematically.
- Identify relationships between numbers and make generalised statements using words, then symbols and letters, e.g. the second number is twice the first number plus 5 ($n, 2n + 5$); all the numbers are multiples of 3 minus 1 ($3n - 1$); the sum of angles in a triangle is 180° .
- Make sense of and solve word problems, single and multi-step (all four operations), and represent them, e.g. with diagrams or on a number line; use brackets to show the series of calculations necessary.
- Solve simple word problems involving ratio and direct proportion.
- Solve simple word problems involving percentages, e.g. find discounted prices.
- Make, test and refine hypotheses, explain and justify methods, reasoning, strategies, results or conclusions orally.