Year 2

Progression in mathematics

The learner

At the start of Year 2, children have already acquired a basic knowledge and understanding of shapes, numbers and the number system. They are beginning to solve problems and are becoming more independent and competent early mathematicians. This, together with the enthusiasm and motivation developed in Year 1, provides a good basis for developing and widening their mathematical knowledge and skills. During Year 2, they develop more sophisticated counting skills, begin to describe and explain patterns and relationships involving numbers and shapes, and use informal methods of recording. They extend their knowledge and use of number facts and develop their understanding of all four arithmetic operations. Home–school links continue to play a vital role in helping children to secure their mathematics.

Children continue to receive systematic mathematics teaching every day. Paired and group work are opportunities for children to talk to each other about their mathematical ideas and methods. Problem solving and measuring offer a chance to draw on children's experiences outside the classroom. They also help to forge links between mathematics and other subjects.

Speaking and listening continues to play an important role in mathematical learning as children extend their use of the vocabulary and language of mathematics. Much of their learning continues to be oral, visual and practical. Recording, including the use of images and simple diagrams, starts to take on a more significant role in helping children to practise, describe and report, and to identify patterns in calculations and shapes. The activities that children engage in should support them in developing many of the key aspects of learning identified in *Excellence and Enjoyment: learning and teaching in the primary years*.

Using and applying mathematics

Children solve problems from real-life and mathematical contexts. They begin to record and carry out the calculations involved, checking that an answer makes sense in the context of the problem. Children use practical resources or ICT to solve shape problems, for example to find how to make known shapes by combining other shapes. They use the ITP 'Fixpoints' to create shapes by moving the corners of a shape drawn on a grid, describing the shapes by referring to their properties.

Children solve logic problems using lists or tables and practical resources; for example, they find four odd numbers that sum to 18, or decide on the fewest moves needed to create five equal groups of objects from unequal groups of a total of 30 objects. They decide if an object satisfies a set of conditions. They understand how 'not' is used to complement a condition such as 'is a triangle' in the condition 'is not a triangle'.

Children choose and use appropriate operations and strategies to solve problems involving money and measures. They use mathematical vocabulary to discuss their methods and solutions. Where appropriate, they make notes, draw diagrams or use practical resources to support mental calculations. They solve interpret increasingly complex one-step and two-step problems, such as: 'Apples cost 40p each. You have 90p and you buy two apples. How much money do you have left?'. They record number sentences to show their method, for example:

40 + 40 = 80
90 – 80 = 10
I have 10p left.

Children describe patterns and relationships involving shapes or numbers. For example, given the sequence 6 + 5 = 11, 16 + 5 = 21, 26 + 5 = 31, …, children use the patterns in the calculations to predict what comes next then check their prediction. They investigate a general statement such as: 'When you add 5 to any number ending in 3, the answer ends in 8'. They test examples, carry out their own calculations and use a calculator to check larger numbers. They propose similar statements that they can test.

Children follow a line of enquiry, working with others and on their own. For example, they identify the lengths that can be measured using combinations of sticks that are 2 cm and 5 cm long. They begin to record their results using pictures or diagrams, explaining their methods in spoken or written form.

Counting and understanding number

Children read and write whole numbers with up to three digits. They count forwards and backwards in ones, twos, fives, tens and hundreds from any small number. They know the value of each digit in a two-digit number, recognising zero as a holder in the units place of multiples of 10. They understand how partitioning helps when they calculate with two-digit numbers; for example, to subtract 23 they know that counting back 2 tens and then 3 will give them the answer.

Children order numbers to at least 100 using the vocabulary and notation of 'greater than' (>) and 'less than' (<). They position two-digit numbers on a number line and round them to the nearest 10. They answer questions such as: 'Which is shorter: 67 m or 76 m?' and identify lengths that lie between the two values.

They count reliably up to 100 objects by forming groups of 10 to support the count. They give sensible estimates of at least 50 objects, for example saying: 'There are between 20 and 30 pasta shells' in a jar containing 24 pasta shells. They recognise and describe sequences, for example continuing the sequence 73, 63, 53, 43, … by counting back in tens. They know which numbers are odd or even to at least 30, and can answer questions such as: 'What even numbers lie between 15 and 20?'. They recognise two-digit multiples of 10, 5 or 2, knowing, for example, that 65 is a multiple of 5 but not of 10 or 2, and that 38 is a multiple of 2 but not of 5 or 10.

Children find halves and quarters of shapes and sets of objects. They recognise that finding a half involves sharing into two equal parts and a quarter sharing into four equal parts. They understand that one quarter and three quarters are complementary and that three quarters is made up of three one-quarter parts. They recognise the relationship between a half and a quarter; for example, a half of £12 is £6 and a quarter of £12 is £3, 'half again'. They begin to associate 'I have spent a quarter of 12p' with the calculation 12 ÷ 4.

Knowing and using number facts

Children derive and recall all pairs of numbers that sum to 20 and the multiples of 10 that sum to 100. They extend their knowledge of addition and subtraction facts to include all numbers to at least 10. They generate pairs of numbers that sum to numbers up to 20; for example, starting with 18 = 10 + 8, they form equivalent statements 18 = 11 + 7 = 12 + 6 = 13 + 5 = …, and explain the process that they use to do this.

Children use their counting strategies to derive multiples of 2, 5 and 10. They relate these to the relevant multiplication tables and learn the tables 'by heart' so that they can recall multiplication facts. They answer questions such as: 'There are six 5p coins in this purse. How much is that altogether?'. Children know that multiplying by 2 corresponds to doubling. They know doubles of all numbers to 20 and the corresponding halves, and use these to derive doubles of multiples of 5 to 50 and the corresponding halves. Children derive related division facts involving 2, 5 and 10 and use these to answer questions such as: '90 pencils are put in boxes of 10 so that there is the same number of pencils in each box. How many boxes is that?'. They answer questions involving halving,

such as: ‘I have an equal number of counters in each hand. Altogether I have 16 counters. How many counters do I have in each hand?’. Children recognise that halving is the inverse of doubling.

Children use their knowledge of rounding and number facts to estimate and check answers; for example, they know that 8 + 27 is just below 40 by adding 30 to 10.

Calculating

Children use the language of addition and subtraction accurately. They read 19 + 15 = 34 as ‘nineteen plus fifteen equals thirty-four’ and 16 – 4 = 12 as ‘sixteen minus four equals twelve’. They use their knowledge of number facts to add or subtract mentally a one-digit number or a multiple of 10 to or from any two-digit number. Children discuss and decide whether to: put the larger number first and count on or back; look for ways to make 10 or 20; or partition and count through multiples of 10 using them as milestones. For example, they recognise that 8 + 23 is 23 + 7 + 1. They use number lines and jottings to help them to carry out calculations. For example, for the calculation 24 – 7, children subtract 4 and then 3, noting the steps that they take.

Children know that addition and subtraction are inverse operations and can state the subtraction calculation corresponding to a given addition calculation and vice versa. They check their answers; for example, to confirm 24 – 7 = 17, they add 17 and 7.

Children understand that multiplication is a shorter form of repeated addition and can be represented by an array. For example, the total in a 5 by 3 array is represented by 5 + 5 + 5 or 5 × 3. They associate the statement: ‘You have two sweets but I have four times as many’ with the calculation 2 × 4. They recognise that questions such as: ‘How many wheels are there altogether on three cars?’ involve multiplication. Children understand division as sharing equally, or as forming groups of the same size through repeated subtraction. They interpret 8 ÷ 2 as: ‘How many objects will each person have if 8 objects are shared equally between 2 people?’ and as: ‘How many groups of 2 can be made from 8 objects?’. Children recognise that division can result in remainders and interpret these in the context of the problem. For example, when they share 13 biscuits between five children, they know that they each have two biscuits and there are three biscuits left in the packet.

Children use mathematical signs and symbols to record number sentences involving each of the four operations. They use their knowledge of number facts to respond to questions such as: ‘I have 40p. How much more do I need to buy a comic that costs £1?’. They apply their understanding of the four operations and their knowledge of facts to identify missing numbers in number sentences such as: □ – 70 = 30, 5 × △ = 20 and 12 ÷ 2 = ○.

Understanding shape

Children name, visualise and make 2-D and 3-D shapes. They understand that placing a shape in a different position or orientation does not change its properties. They use this understanding to identify common 2-D shapes and 3-D solids from pictures. Children identify common features of shapes, such as ‘has a line of symmetry’ or ‘has a triangular face’. They solve problems that require them to complete shapes by drawing lines of symmetry or to predict shapes from pictures or other information. They select and organise shapes to build models or to meet conditions, such as finding out how many cubes will pack into a box, or the different hexagons that can be made on a 4 by 4 pinboard. They describe the shapes that they make and say why they are different.

Children describe and make whole, half and quarter turns, clockwise and anticlockwise. They know that a quarter turn is called a right angle, and they identify right angles in shapes and patterns and in the environment. They use mathematical language to describe position, direction and movement. For example, they give instructions to a partner on how to build a simple shape from squares and triangles or they direct a programmable toy.

Measuring

Children read the numbered divisions on a scale and interpret unnumbered divisions between them, for example, on a set of scales with 100 g marks numbered, but 10 g intervals unnumbered. They use standard units to measure accurately to the nearest division. For example, with rulers and tape measures, they measure to the nearest centimetre to compare the strides of children in the class against strides made by different animals. They begin to make connections between related standard units, for example identifying objects estimated as being less than 1 kg and then weighing them to determine which of the objects weighs less than half a kilogram. They solve problems involving mass or capacity. For example, they find the weight of one marble in grams and then scale up by multiplying to work out the weight of boxes of two, five or ten marbles. They check their answers by weighing the boxes. They estimate then check whether the capacity of different containers is less than a quarter of a litre, between a quarter and a half of a litre, between a half and three quarters of a litre, or more than three quarters of a litre.

As well as knowing the months and seasons of the year in order, children know significant times in the day and the year. They begin to understand the relationship between units of time and can work out, say, how many days there are in seven weeks. They read the time to the quarter hour on both digital and analogue clocks, and identify time intervals, including those that cross an hour boundary. For example, they answer questions such as: 'It's quarter to three now. School finishes at a quarter past three. How long is it before we go home?'.

Handling data

Children answer questions such as: 'Is it quicker to write or to type a sentence?'. They decide how they might collect data related to the question to compare, say, how many copies of the sentence they can write or type in two minutes. In groups, they collect and record their data using simple lists and tables. Children organise and present their results as block graphs or pictograms, using ICT where appropriate. They interpret and communicate their findings and decide on an answer such as: 'It is quicker to write than to type'. They make further observations, such as identifying the number of sentences that most children in the class can type or write in a minute.

Children recognise how to record and present data in other subjects. For example, they use data from geography about buildings in a street and use pictograms to represent the types of buildings or their purposes and block graphs to show the ages of the buildings or the numbers of floors or rooms each building has.

Children sort objects such as shapes that do and do not have a right angle, patterns that do and do not have a line of symmetry, or objects that will or will not fit in a particular container. Children explain their groupings using mathematical language to describe characteristics that items do or do not have in common. For example, they decide which numbers between 18 and 29 are odd or even, and they organise shapes by 'all sides shorter than 5 cm' or 'has five or more sides'. They explain their choices by saying, for example: 'This rectangle does not go here because all its sides are longer than 5 cm' or: 'This triangle goes here as it does not have five or more sides'.

Embedding key aspects of learning

Year 2 children's thinking, communication and social skills continue to develop as they explore and discuss their mathematics. They begin to follow a line of enquiry and choose and use the equipment that they need to carry this out, explaining why they made their decisions. They describe how they use the equipment and decide if it was suitable for the task.

Children's information processing skills are developed as children collect and record data they need to answer questions. They record their results in simple lists and tables and present their results

using block graphs or pictograms, using ICT where appropriate. They begin to reason when they recognise and extend sequences and solve mathematical puzzles. For example, children draw conclusions about the whole shape when they observe part of it,s and they order items from statements that identify their relative positions in a queue.

Children's communication becomes more precise as they use, for example, the language and symbolism of calculation and the vocabulary of estimation and time. Working with other children and adults develops their social skills. They begin to develop a greater awareness of how they learn as they think about their own learning goals in mathematics.