Maths Calculation Policy

Rationale

Purston Infant School's calculation policy has been devised to meet the requirements of the National Curriculum for the teaching and learning of mathematics.
We follow the Maths Hub programme to ensure coverage of all aspects of mathematics throughout Key Stage 1. The calculation policy is designed to give pupils a consistent and smooth progression of learning in calculation across the school. Early learning in number and calculation in reception follows the Early Years Statutory Framework 2021, and this calculation policy is designed to build on progressively from the concept and methods established in the Early Years Foundation Stage.
In Key Stage 1 in line with the Maths Hub, when children are introduced to a new key concept they are given the opportunity to build competency in the topic by taking the following approach.
Concrete – where children are given the opportunity to use concrete objects to develop understanding of what they are doing.
Pictoral – the concrete approach should be built on by using pictoral representations, which can be used to reason and problem solve.
Abstract – when the foundations are firmly laid, children should be able to move to an abstract approach where they can use numbers and key concepts with confidence.
We are developing fluency skills through having a number of the day / week and we follow the Mastery Number Programme in order to develop children's skills and understanding.

Year group expectations – refer to Progression Grids

Addition:

Mental Maths Skills

Developing a quick mental recall of mathematical facts is a crucial part of the National Curriculum. Here are a few examples of the steps to develop mental recall skills without the use of equipment or a written method.

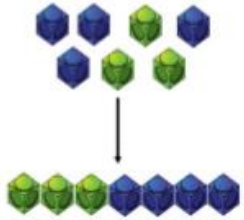
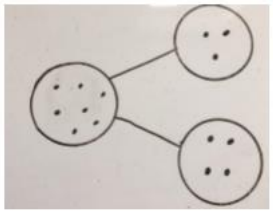
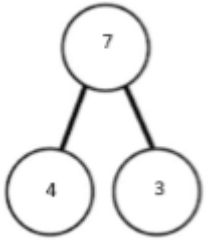
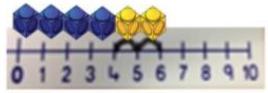
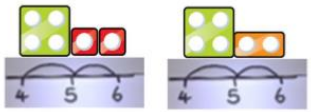
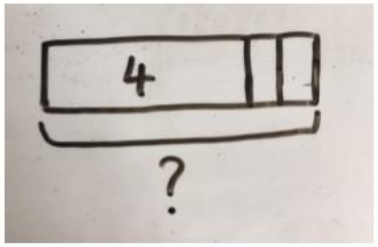
EYFS – Recognise numbers to 10. Say one more than a number. Idenitfy number bonds to and within 10 (To 10 - 1 and 9, 2 and 8, 3 and 7 etc. To 5 – 0 and 5, 1 and 4, 2 and 3 etc).

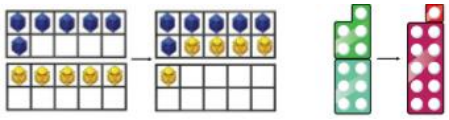
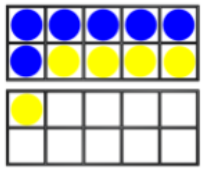
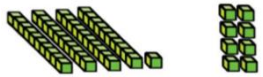
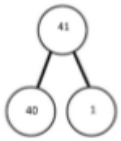
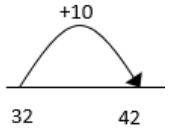
Year 1 – Idenitfy the tens digit and ones digit (previously units).Idenitfy number bonds to and within 20 (To 20 - 1 and 19, 2 and 18, 3 and 17 etc. To 12 – 0 and 12, 1 and 11, 2 and 10.) Add a 1 digit number to a 1 digit number (5+3). Add a 1 digit number to a 2 digit number to 20 (12+4). Add 10 to a number (15+10).

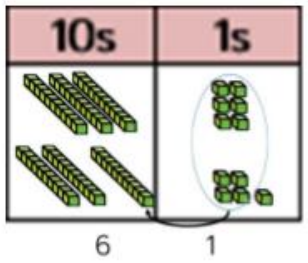
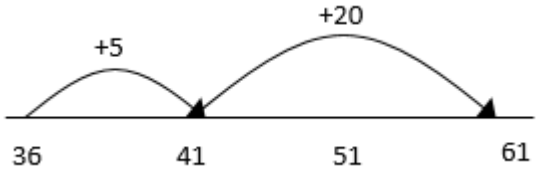
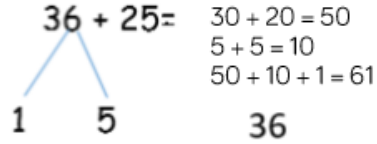
Year 2 – Add tens to a number (23+30). Add a 2 digit number to a 2 digit number (without crossing the ten 42 + 31. With crossing the ten 26 + 48). Identify number bonds to 100 (0 and 100, 10 and 90, 20 and 80 etc).

To support the development of Mental Maths skills we teach ‘Fluency’ through following our ‘Number of the week’ in Foundation Stage and ‘Number of the day’ in Key Stage 1.

Key language: sum, total, parts and wholes, plus, add, altogether, more, ‘is equal to’, ‘is the same as’.

Concrete	Pictorial	Abstract
Children are supported in developing an understanding of how two parts make a whole by using resources that link to the year group topic such as cars, teddy bears and egg shells. 	Children move on to representing these objects by using pictorial representations, for example by drawing a car or using dots or crosses to represent the object. They may represent them in a part, whole model as shown below. 	Children then recognise that, using the part, whole model previously, 4 is a part, 3 is a part and the whole is seven. They then represent these in an abstract way by writing a number sentence. 4 + 3 = 7 
Children count on number lines, understanding the value of a number. They may use Numicon or cubes.  	Bar models encourage children to count on, rather than count all. 	Children can then begin to create their own number line following question such as: What is 2 more than 4? What is the sum of 2 and 4? What is the total of 4 and 2? 4 + 2 = 

Children regroup to make 10 by using resources including 10 frames and Numicon. 	Children then draw their own 10 frames and counters. 	Children develop an understanding of equality and recall number bonds to 10 to support them in answering questions such as the one below. $6 + \square = 11$ $6 + 5 = 5 + \square$ $6 + 5 = \square + 4$
TO + 0 (tens and ones + ones) using Base 10. Children continue to develop their understanding of place value and partitioning by using Base 10. 41 + 8 	Children represent the Base 10 by drawing a line for 10 and a square or circle for 1. 	Children can then represent this by writing number sentences or completing a part, whole model. $1 + 8 = 9$ $40 + 9 = 49$ 
TO + T (tens and ones + tens) using Base 10, the number line or the 100 square. Children generate an understanding of ten more than with growing security of the place value of numbers and through counting in class. 32 + 10  	Children represent the Base 10 as above or by using a blank number line.  	Children can then begin to tackle missing number problems in written form. 32 + ? = 42
TO + TO (tens and ones + tens and ones) using Base 10 and the number line. 36 + 25	Children use a blank number line and place value knowledge to jump in ones and then tens.	Looking for ways to make 10.

		 Following on from the number line - 36 + 5 = 41 41 + 20 = 61

Subtraction:

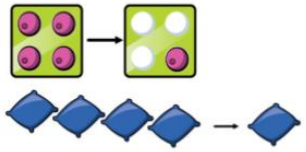
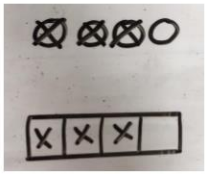
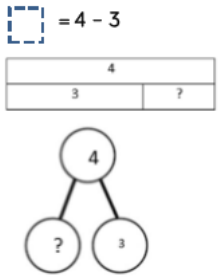
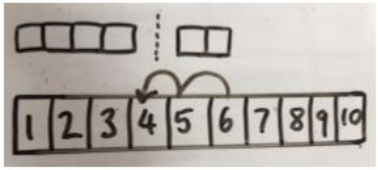
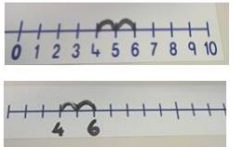
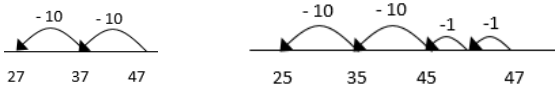
Mental Maths Skills

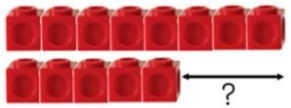
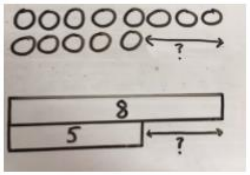
EYFS – Recognise numbers to 10. Say one less than a number. Identify number bonds to and within 10 and recognise related facts to 10 (1 and 9 make 10 so 10 subtract 1 makes 9).

Year 1 – Identify the tens digit and ones digit (previously units). Identify number bonds to and within 20 and derive related facts (1 and 19 make 20 so 20 subtract 1 makes 19.) Subtract a 1 digit number from a 1 digit number (5-3). Subtract a 1 digit number from a 2 digit number to 20 (12-4). Subtract 10 from a number (15-10).

Year 2 – Subtract tens from a number (53-30). Subtract a 2 digit number from a 2 digit number (without exchanging the ten 42 - 31. With exchanging the ten 56 - 48). Identify number bonds to 100 and derive related fats (10 and 90 make 100 so 100 – 90 makes 10).

Key language: Take away, less than, the difference, subtract, minus, fewer, decrease.

Concrete	Pictorial	Abstract
Children physically take away and remove objects from a whole (ten frame, Numicon, cubes and other items such as bean bags) to gain an understanding of there being 'less than' before. 4 – 3 = 1 	Children draw concrete objects they are using and cross out the correct amount. The bar model can also be introduced. 	Children write number sentences following this. 4 – 3 = 1 They can solve missing number problems using what they already know. 
Children count back using number lines or number tracks. 6 – 2 = 4 	Children represent what they see pictorially. 	Children represent the calculation on a number line or number track and show their jumps. Children are then able to move on to a blank number line. 
TO – T and TO – TO using the number line. Children should develop a secure understanding of subtracting 10 using place value knowledge and counting in class. They will also refer to the 100 square to spot patterns and relationships.	Children draw a blank number line to solve calculations. They jump in ones and then tens from right to left. 	Following on from the number line – 47 – 2 = 45 45 – 20 = 25

Finding the difference and counting on using cubes, Numicon or other objects linked to the topic. Calculate the difference between 8 and 5.  Children can use this knowledge when faced with problems such as 100 – 98, where it would be more efficient to count on from 98 to 100 rather than subtract 98 from 100.	Children draw the cubes/other objects which they have used or use the bar model to illustrate what they need to calculate.  	Children solve missing number problems such as: 8-5, the difference is … Children can also explore why 9 – 6 = 8 – 5 = 7 – 4

<u>Teaching for Mastery in addition and subtraction:</u> Whilst progressing through the calculation policy, children will be required to reason and problem solve in order to gain a mastery understanding of the specific skill taught. Children will be questioned carefully to enable them to think deeply about their learning or a strategy for working out a problem. For example, children may be asked to:

Continue a pattern –

90 = 80 + 10	100 – 10 = 90
90 = 70 + 20	100 – 20 = 80
90 = 60 + 30	100 – 30 = 70

Find a missing number –

91 + ? = 100	100 - ? = 89

Find out whether something is true, false or sometimes true –

Odd + odd + odd = odd	98 – 18 = 70
Even + even + even = even	92 – 67 = 35

Describe whether they think questions are hard or easy –

23 + 10 =	100 – 1 =
93 + 10 =	100 – 99 =
54 + 9 =	98 – 38 =

Find all possibilities –

? + ? + ? = 14	20 = ? - ? - ?

Find fact families –

Use only the numbers 100, 67, 33
Recall other facts using a given number sentence –
87 = 100 - 13
Identify missing symbols –
80 ? 20 ? 100 100 ? 70 ? 30
Convince me –
7? + 2? = 99 7? – 2? = 46
Make an estimate –
55 + 17
74 – 13
87 – 34
Create a question -
The answer is 87, what could the question be?
Create a Maths story –
Use the number sentence 4 + 6 = 10 to create a Maths story.
True or false? –
6 + 4 = 11
Odd one out –
4 + 6 3 + 7 2 + 9

<u>Multiplication:</u>

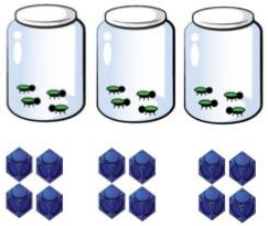
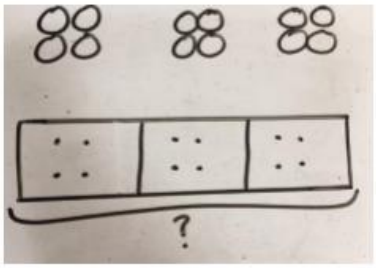
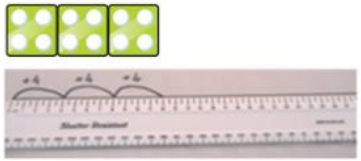
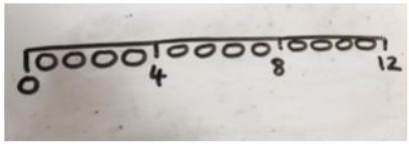
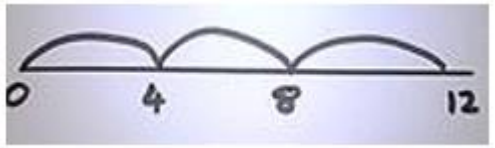
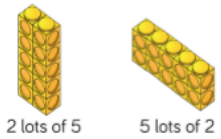
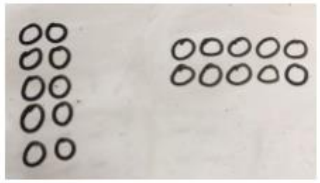
Mental Maths Skills

EYFS – Recall simple doubles.

Year 1 – Count in multiples of 2, 5 and 10 from 0.

Year 2 – Count in multiples of 2, 3, 5 and 10 from any number, forwards and backwards. Know facts in isolation e.g. 5x6=30. Understand multiplication can be calculated in any order (2x3 is the same as 3x2). Make deductions using known multiplication facts e.g. knowing 18x5=92 cannot be correct as multiples of 5 end in a 0 or a 5.

Key language: double, times, multiplied by, the product of, groups of, lots of, equal groups.

Concrete	Pictorial	Abstract
Children use their knowledge of addition and begin with repeated addition or repeated grouping using objects. 3 x 4 4 + 4 + 4 	Children represent these objects in a picture or using the bar model. 	Children write the number sentence – 3 x 4 = 12 4 + 4 + 4 = 12
Children can represent repeated groups on a number line or by using Numicon. 3 x 4 	Children represent this on their own number line, representing objects with circles. 	Children use a blank number line representing jumps with numerals. Children count in multiples known to them (2, 3, 5,  10).
Children use arrays to illustrate commutativity using objects such as counters. 2 x 5 = 5 x 2 	Children then draw the objects. 	Children use the arrays to answer a range of questions such as – 10 = 2 x 5 5 x 2 = 10 2 + 2 + 2 + 2 + 2 = 10 10 = 5 + 5

Division:

Mental Maths Skills

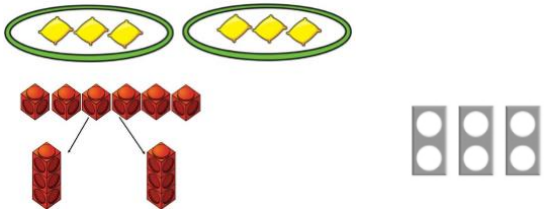
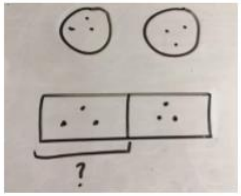
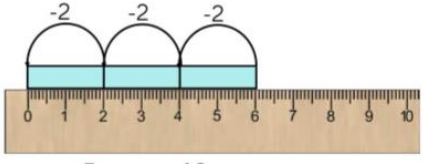
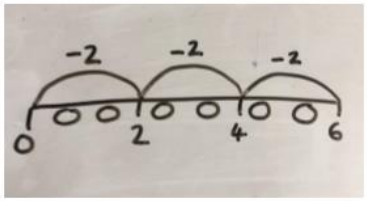
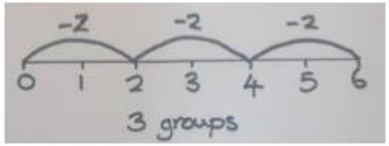
EYFS – Recall simple halves (half of 2 is 1).

Year 1 – Count in multiples of 2, 5 and 10 from 0. Use this knowledge to derive related division facts.

Year 2 – Count in multiples of 2, 3, 5 and 10 from any number, forwards and backwards. Use this knowledge to derive related division facts. Know facts in isolation e.g. 15÷5=3

Understand division cannot be calculated in any order (15÷3 is not the same as 3÷15).

Key language: share, group, divide, divided by, half

Concrete	Pictorial	Abstract
Children learn to share using a range of objects. 6 ÷ 2 	They then represent sharing using pictures. 	Children begin to write the number sentence. They represent the objects in a pictorial representation with numbers. Children count in multiples known to them (2, 3, 5, 10). 
Children can represent repeated subtraction on a number line or ruler.  3 groups of 2	Children represent the repeated subtraction pictorially. 	Children use a blank number line representing jumps with numerals. 

Teaching for Mastery in multiplication and division:

Whilst progressing through the calculation policy, children will be required to reason and problem solve in order to gain a mastery understanding of the specific skill taught. Children will be questioned carefully to enable them to think deeply about their learning or a strategy for working out a problem.

For example, children may be asked to:

Find a missing number –

10 = 5 x ? ? ÷ 2 = 10

Make links between division and multiplication –

I have 30p in my pocket in 5p coins. How many coins do I have?

Write the multiplication number sentences to describe an array. Write the division number sentences that also describe it.

Prove it –

Which four number sentences link these numbers? 3, 5, 15

Find out whether something is true or false –

When you count up in tens starting at 5 there will always be 5 ones.

Use the inverse –

Use the inverse to check whether these calculations are correct:

12 ÷ 3 = 4

3 x 5 = 14

Find the odd one out –

15, 25, 30 (25 – not divisional by 3).

Create a question -

The answer is 25, what could the question be?

Create a Maths story –

Use the number sentence 3 x 5 = 15 to create a Maths story.

True or false? –

5 x 6 = 36

Which is the correct answer? –

38 x 2 = 75 76 77