

Calculation Policy 2023

Updated: September 2023 Next Review: September 2024

Mathematics Mastery

At the centre of the mastery approach to the teaching of mathematics is the belief that all children have the potential to succeed. They should have access to the same curriculum content and, rather than being extended with new learning, they should deepen their conceptual understanding by tackling challenging and varied problems. Similarly, with calculation strategies, children must not simply rote learn procedures but demonstrate their understanding of these procedures through the use of concrete materials and pictorial representations. This policy outlines the different calculation strategies that should be taught and used in Year 1 to Year 6 in line with the requirements of the 2014 Primary National Curriculum.

Background

The 2014 Primary National Curriculum for mathematics differs from its predecessor in many ways. Alongside the end of Key Stage year expectations, there are suggested goals for each year; there is also an emphasis on depth before breadth and a greater expectation of what children should achieve. In addition, there is a whole new assessment method, as the removal of levels gives schools greater freedom to develop and use their own systems. One of the key differences is the level of detail included, indicating what children should be learning and when. This is suggested content for each year group, but schools have been given autonomy to introduce content earlier or later, with the expectation that by the end of each key stage the required content has been covered. For example, in Year 2, it is suggested that children should be able to 'add and subtract one-digit and two-digit numbers to 20, including zero' and a few years later, in Year 5, they should be able to 'add and subtract whole numbers with more than four digits, including using formal written methods (columnar addition and subtraction)'. In many ways, these specific objectives make it easier for teachers to plan a coherent approach to the development of pupils' calculation skills. However, the expectation of using formal methods is rightly coupled with the explicit requirement for children to use concrete materials and create pictorial representations – a key component of the mastery approach.

Mathematical Language

The 2014 National Curriculum is explicit in articulating the importance of children using the correct mathematical language as a central part of their learning (reasoning). Indeed, in certain year groups, the non-statutory guidance highlights the requirement for children to extend their language around certain concepts. It is therefore essential that teaching using the strategies outlined in this policy is accompanied by the use of appropriate and precise mathematical vocabulary. New vocabulary should be introduced in a suitable context (for example, with relevant real objects, apparatus, pictures or diagrams) and explained carefully. High expectations of the mathematical language used are essential, with teachers only accepting what is correct.

How to use the policy

This calculations policy is a guide for all staff at Green Park CPS and has been adapted from work by the White Rose Maths Hub. It is purposely set out as a progression of mathematical skills and not into year group phases to encourage a flexible approach to teaching and learning. It is expected that teachers will use their professional judgement as to when consolidation of existing skills is required or if to move onto the next concept.

However, the focus must always remain on breadth and depth rather than accelerating through concepts. Children should not be extended with new learning before they are ready, they should deepen their conceptual understanding by tackling challenging and varied problems. All teachers have been given the scheme of work from the White Rose Maths Hub and are required to base their planning around their year group modules. These modules use the Singapore Maths Methods and are affiliated to the workings of the 2014 Maths Programme of Study.

Teachers can use any teaching resources that they wish to use and the policy does not recommend one set of resources over another, rather that, a variety of resources are used. For each of the four rules of number, different strategies are laid out, together with examples of what concrete materials can be used and how, along with suggested pictorial representations. The principle of the concrete-pictorial-abstract (CPA) approach [Make it, Draw it, Write it] is for children to have a true understanding of a mathematical concept, they need to master all three phases within a year group's scheme of work.

Skill	Concrete	Pictorial	Abstract
Add one- digit numbers within 10.			4 + 3 = 7

















Glossary

Addend - A number to be added to another.

Aggregation - combining two or more quantities or measures to find a total.

Augmentation – increasing a quantity or measure by another quantity.

Commutative – numbers can be added in any order.

Complement – in addition, a number and its complement make a total e.g. 300 is the complement to 700 to make 1,000

Difference – the numerical difference between two numbers is found by comparing the quantity in each group.

Exchange – Change a number or expression for another of an equal value.

Minuend – A quantity or number from which another is subtracted.

Partitioning – Splitting a number into its component parts.

Reduction – Subtraction as take away.

Subitise – Instantly recognise the number of objects in a small group without needing to count.

Subtrahend - A number to be subtracted from another.

Sum - The result of an addition.

Total – The aggregate or the sum found by addition.

Skill	Concrete	Pictorial	Abstract
2 Times Tables		0 2 4 6 8 10 12 14 16 18 20 22 24	
		1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 45 46 47 48 49 50	
5 Times Tables		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	

Skill	Concrete	Pictorial	Abstract
10 Times Tables		1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 60 91 92 93 94 95 96 97 98 99 60	
3 Times Tables		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	

Skill	Concrete	Pictorial	Abstract
4 Times Tables		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
8 Times Tables		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	

Skill	Concrete	Pictorial	Abstract
6 Times Tables		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
9 Times Tables		0 9 18 227 36 45 54 63 72 81 90 99 108 1 12 13 4 15 16 17 10 19 20 21 22 23 24 25 26 22 28 29 30 31 14 15 16 17 18 19 20 21 22 23 24 25 26 22 28 29 30 31 32 33 34 35 66 67 88 69 70 71 72 73 74 75 76 77 78 79 80 61 62 63 64 65 66 67 88 96 90 9 18 27 36 45 54 63 72 81 90 9 18 27 36 45 54 63 72 81 90 90 91 91	

Skill	Concrete	Pictorial	Abstract
7 Times Tables		0 7 14 21 28 35 42 49 56 63 70 77 84	
		1 2 3 4 5 6 $\overline{2}$ 8 9 10 11 12 13 16 15 16 17 18 19 20 20 22 23 24 25 26 27 28 29 30 31 32 33 34 66 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 66 67 68 69 $\overline{00}$ 71 72 73 74 75 76 $\overline{7}$ 78 79 80 81 82 83 495 96 97 68 99 100 7 14 21 28 35 456 63 70 42 49 56 63 70 70 70	
11 Times Tables		0 11 22 33 44 55 66 77 88 99 110 121 132 1 2 3 4 5 6 7 8 9 10 121 132 1 1 1 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 45 46 47 48 49 50 55 55 56 57 58 59 60 61 62 63 64 65 67 68 69 70 71 72 73 74 75 76 77 78 79 80 11 22 33 444 55 66	
		II II II II II III IIII IIIII IIIII IIIII IIIII IIIIIIIII IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	
		91 92 93 94 95 96 97 98 99 100 77 88 99 110 121 132	

Skill	Concrete	Pictorial	Abstract
12 Times Tables		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
Solve 1 step problems involving multiplication			One bag holds 5 apples. How many apples do 4 bags hold? 5 + 5 + 5 + 5 = 20 $4 \times 5 = 20$ $5 \times 4 = 20$







Skill	Concrete	Pictorial	Abstract
Multiply a three-digit number by a two-digit number.	100 100 10 <	As concrete	$234 \times 32 = 7,488$ $\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$
Multiply a			7 4 8 8
four-digit number by a			2,739 × 28 = 76,692
two-digit number.			
			× 2 8
			$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
			5 4 7 8 0 1 1
			7 6 6 9 2

Skill	Concrete	Pictorial	Abstract
Solve one- step problems involving division (sharing).			There are 20 apples altogether. They are shared equally between 5 bags. How many apples are in each bag? $20 \div 5 = 4$
		?????	
Solve one- step problems involving division (grouping).			There are 20 apples altogether. They are put in bags of 5. How many bags are there? $20 \div 5 = 4$
Dividing a two-digit number by a one-digit number (sharing – no exchange).	Tens Ones 0 0 0 0 0 0 0 0 0	$ \begin{array}{c} 48 \\ 40 \\ \div 2 \\ \hline \end{array} $	48 ÷ 2 = 24



Skill	Concrete	Pictorial	Abstract
Divide a two- digit number by a one- digit number (grouping)	Tens Ones 10 10 10 10 10 10 10 10 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1	As concrete	$52 \div 4 = 13$ 1 3 4 5 12
Divide a three-digit number by a one digit number (sharing).	H T O 100 10 1 100 10 1 100 10 1 100 10 1 100 10 1 100 10 1 100 10 1 100 10 1	$ \begin{array}{c} 844\\ 800\\ 40\\ 40\\ 40\\ 40\\ 40\\ 40\\ 2 \end{array} $ $ \begin{array}{c} 844\\ 844\\ 844\\ 844\\ 844\\ 844\\ 2 ????? $	844 ÷ 4 = 211
Divide a three-digit number by a one digit number (grouping).	Hundreds Tens Ones 100 100 10	As concrete	$856 \div 4 = 214$ $2 \ 1 \ 4$ $4 \ 8 \ 5 \ 16$

Skill	Concrete	Pictorial	Abstract
Divide a four-digit number by a one-digit number (grouping).		As concrete	$8,532 \div 2 = 4,266$ $4 \ 2 \ 6 \ 6$ $2 \ 8 \ 5 \ 1_3 \ 1_2$
Divide a multi-digit number by a		15 30 45 60 75 90 105 120 135 150	$\boxed{432 \div 12 = 36}$
two-digit number (short division).			$\begin{array}{ c c c c c c c c c c c c c c c c c c c$
Divide a multi-digit number by a two-digit			$432 \div 12 = 36$
number (long division).			$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
			$372 \div 15 = 24 \text{ r12}$
			$\begin{array}{c ccccccccccccccccccccccccccccccccccc$

Glossary

Array – An ordered collection of counters, cubes or other item in rows and columns.

Commutative – Numbers can be multiplied in any order.

Dividend – In division, the number that is divided.

Divisor – In division, the number by which another is divided.

Exchange – Change a number or expression for another of an equal value.

Factor – A number that multiplies with another to make a product.

Multiplicand – In multiplication, a number to be multiplied by another.

Partitioning – Splitting a number into its component parts.

Product – The result of multiplying one number by another.

Quotient - The result of a division

Remainder – The amount left over after a division when the divisor is not a factor of the dividend.

Scaling – Enlarging or reducing a number by a given amount, called the scale factor