

Written and Manipulatives Policy
Signed: Date: Date: Chair of Governors
Signed: Date: Date:
Adopted and Approved by the Governing Body: <b>October 2023</b> Review Date: <b>October 2027</b>

## Written Manipulatives Calculation Policy

The intent of our Mathematics curriculum is to be accessible to all and to maximise the development of every child's ability and academic achievement. Every child has an equal opportunity to access maths at their level and pace and this is catered for through differentiation to enhance a safe learning environment. We want children to make rich connections across Mathematical ideas to develop fluency, reasoning and problem solving and their taught resilience will enhance and develop these skills. Within (and beyond) lessons, children are challenged with "next steps" and extensions, creating a culture, where, within lessons, our learners want to be ambitious in all that they access and achieve. Our pupils will learn to apply their Mathematical knowledge not only within their Mathematics lessons but also across the curriculum, for example in Art, Science, Geography and DT. We want our pupils to understand that a confident understanding of Mathematics is the bedrock for Science, Technology and Engineering (STEM), necessary for the management of every day finances and a crucial component of most forms of employment. As our pupils progress, we intend that they: be able to calculate swiftly and accurately; have the ability to reason mathematically; have an appreciation of the beauty and power of mathematics and a sense of enjoyment and curiosity about the subject.

	Statutory Expectations		ADDITION									
YR	Count from 1-20 and say which no. is 1 more than a given no. Using quantities objects, + two ones and count on to find the answer. [Expected] Estimate no. of objects; check quantities by counting up to 20. [Exceeding]	<ul> <li>Practical or recorded using ICT.</li> <li>e.g. Hannah listed how many girls a boys were outside. [She] was a "There are 5 girls and 4 boys. Th altogether".</li> <li>When playing in the shop. Christ shopping list to add 2 amounts. beans are 5 pence and the bana pence, altogether that is 8 pence</li> </ul>	nd how many let to say that lat's 9 opher used his. He said "the use are 3 "	505	Dominoes, dice, counters. Pictures/Objects I eat 2 cakes and my friend eats 3. How many cakes did we eat altogether?			8 	Symbolic 8 people are on the bus. 5 more get on at the next stop. How many people are on the bus now 			
YI	Add (and subtract) one-digit and two-digit numbers to 20 (9 + 9, 18 - 9), including zero Read/write/interpret statements involving addition (+), subtraction (-) and equals (=) signs.	Pupils use concrete objects and pictorial representations. (eq. dienes, double sided counters, number lines, numicon) Problems should include terms: put together, add, altogether, total, take away, distance between, more than and less than, so pupils develop concept of +/- and use operations flexibly.	Practical/recorded using ICT Pictures/Symbolic ( <i>see YR</i> )	Visuc (mod string 13 + 1 00000	t elled using bead (s/double sided counters) 5 = 18	Visual (efficient jur 13 + 5 = 18 [jumps may be in 1 +2 13 14 15	nps)	Use known facts/partition 8 + 5 + 13 8 + 2 = 10 10 + 3 = 13 Breaking up n	ning.	g numicon		
Y2	TO + O TO + T TO + TO O + O + O [Show addition of two numbers can be done in any order.]	Recognise/use inverse relationship between +/- and use to check calculations and missing number problems. Pupils use concrete objects, pictorial		1	Visual (efficient jumps) Us 35 + 47= 82	+ 2 e alongside dienes	No number line 35 + 47 = 82 47 + 30 = 77 77 + 3 = 80	Partitioning, 35 + 47 = 82 40 + 30 = 70 7 + 5 = 12	,	Chaining. Bar Model 23+21 = 40+4	leva interest interes	

		representations and							80 + 2 = 82		
		mental strategies									
		(e.g. dienes, 100 square, abacus, numicon)									Estimate answers and use inverse to check.
						[Also	jumps can be in 10s and	t 1s]			
	lites <b>0</b>	Discoursion constant disc		Les average and the s	Chaining	Martinel and a				Commention	Estimate annual and an improved a shack
	columnar addition.	Place value counters, alen	es in	no number une	Chaining	multi base ar	id place value counters	Tens Ones	2 5	374	Estimute unswers and use inverse to check.
	то + то	Number line 57 + 285	= 342	$\frown$						+ 248 Use	
	HTO + TO HTO + HTO	Use almaside dienes as n	l f	1 57 + 285 = 342	56+33 = 80+9			<b>**</b> *	// 📉	<u>622</u> alongside	
2/2				200 012	50 55 50 7			00	· · · · ·	place value counters	
¥3		+ 50	2	285 + 50 = 335 235 + 7 = 342				•			
				55 7 542	Bar model						
		285 335	342		(						
					(see Y2)						
	Use <b>formal</b> written methods of	Estimate and use	Chaining			5	735 + 562 = 6297			Solve addition two-step p	problems in contexts, deciding which operations and
	columnar addition.	inverse operations to check answers to a		789 + 642 =	1431					methods to use & why.	
	HTO + HTO ThHTO + HTO	calculation.		107 012			5735				
	ThHTO + ThHTO		132+121=100+50+	+3 78	9		+ 562			Salve simple measure and	money problems involving Practices and decimals to
				+ 6 4	2		6297			2dp	
		Estimate, compare and calculate different		<b>1 4 3</b>	1		1				
Y4		measures, including									
		pence.									
					Sio or						
				00 00 10 00 00 10							
	Add whole numbers >4 digits, including using <b>formal</b> written	Use rounding to check and and determine, in the cont	wers to calculations ext of a problem	Solve problem	ms involving number i	ıp to 3dp.	Chaining			Compact vertical	Pupils practise adding decimals, including a mix of whole numbers and decimals, decimals with
	methods (columnar addition).	levels of accuracy.		Solve problem	ms involving convertin 2. [ <i>Measurement</i> ]	ıg between					different numbers of decimal places, and
		Salve addition multi-step	nmhlems in contexts		. [		22/1222 / 00/50/5	7		22.70	complements of 1.
	Decimals up to 2dp (eq. 72.5 + 45.7)	deciding which operations	and methods to use	2 Use all four	onerations to solve ar	thlems	234+223=400+50+	I		23.70	
	(- <i>d</i> )	and why.		involving me	easure [eg length, mas	s, volume,	Bar model			+ <u>48.5</u> 6	Compact vertical Using place value counters.
Y5				money] usin scaling. [ <i>Me</i>	g decimal notation inc <i>pasurement</i> ]	cluding	Whole ?			72.26	
					-		Part	Part			
											3.243
										11	+ 18.070

						21.313
	Solve multi-step problems in	Use estimation to check	Use knowledge of	Solve problems which require answers to be rounded	to Chaining	Compact vertical using place value counters
	contexts, deciding which	answers to calculations	the order of	specified degrees of accuracy. [ <i>Fractions</i> ]		
	operations/ methods to use	and determine, in the	operations to carry			
	Decimals up to 3dp. (Context:	context of a problem, an	out calculations			
	Mensures)	appropriate degree of	involving		453+342=700+90+5	3.243
		accuracy.	subtraction.	Solve problems involving the calculation and convers	ion	
				of units of measure, using decimal notation to 3dp w	here Bar model	+ 18.070
Y6				appropriate. [ <i>Measurement</i> ]		
						21.313
						2 1

	Statutory Expectations			S	UBTRACTION			
YR	Count from 1-20 and say, which no. is 1 less than a given no. Using quantities objects, subtract two U numbers and count back to find the answer. [Expected] Estimate no. of objects; check quantities by counting up to 20. [Exceeding]	Practical or recorded using Chloe was playing in the m she added some cubes to th than her friend. "Oh, I have have the same". During a game of skittles or skittles down. He was able [EYFS Profile exemplificatio	ICT. haths area. "I need three more" she said as te circle. She then realised she had more e too many". She removed one. "Now we utdoors Joseph knocked three numbered e to calculate his score in his head.	Pictures/Objects I have five cakes. I eat two of them. How r	nany do I have left? 10-3 = 7	Symbolic Mum baked 9 biscuits. I ate 5. How many were left? [Might be recorded as: 9 - 5 = 4]		
YI	Subtract (and add) one-digit and two-digit numbers to 20 (9 + 9, 18 - 9), including zero Read/write/interpret statements involving addition (+), subtraction (-) and equals (=) signs	Practical or recorded using ICT. Pupils use concrete objects and pictorial representations (e.g. place value counters, Dienes, numicon)	Taking away – jumps of 1 (modelled using bead strings) 13 – 5 =8	Taking away.         (efficient jumps) 13 - 5 = 8 $3 = 10$ 13 - 3 = 10         10 - 2 = 8	Counting on - jumps of 1 (modelled using bead strings) 11 - 8 = 3 +1 + 1 + 1 + 1 8 9 10 11	difference between and $e$ is $e$ 8 - 5 = 3	<b>Counting on</b> (efficient jumps) With, or without, number line 8 + 2 = 10 10 + 1 = 11	

	TQ - Q		Practic	cal/visual images				1.1			
Y2	TO - tens TO - TO [Show subtraction of two numbers <u>cannot</u> be done in any order.]	Recognise/use relationship betw. +/- tor check calculations and missing number problems. Pupils use concrete objects and pictorial representations and <b>mental strategies</b> (eg. place value counters, Dienes)	95 - 60 = 35		Taking away $84 - 36$	6 = 48 84 e in 10s/1s	Taking away (no number line) 84 - 36 = 48 84 - 30 = 54 54 - 4 = 50 50 - 2 = 48 Use arrow cards		Find the Difference $84 - 48 =$ $\frac{+30}{485054}$	36 	Recording subtraction in columns supports place value and prepares for formal written methods with larger numbers. 98 - 35 = 63 90 and 8 <u>30 and 5</u> <u>60 and 3</u>
	Use <b>formal</b> written methods of columnar addition TO - TO HTO - TO HTO - HTO	Dienes, numicon, place value	e counters. = 47	<b>Taking away</b> (no n 326 - 178 = 148	umber line)	$ \begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	Oral and practical Decomposition		Decomposition	Tens Ones 7 2 (6) + (1) 4 7 457 = 475	Estimate answers and use inverse to check.
Y3		+ 11 + 36	436	326 - 100 = 226 226 - 70 = 156 156 - 6 = 150 150 - 2 = 148		No decomposition	700 20 3 400 50 8 600 110 13 400 50 8 200 60 5	723 - 458 = 265			Bar Model
¥4	Use <b>formal</b> written methods of columnar subtraction. HTO - HTO ThHTO - TO ThHTO - HTO ThHTO - HTO ThHTO - ThHTO	Dienes, place value counters, <b>Counting on</b> 1324 - 968 = 356	numicon + 32 968 1000	+ 324	Decomposition $13^{5}\sqrt{4}$ -968 406 1374 - 968 = 406	Solve subtraction two methods to use and w Solve simple measure o	-step problems in co hy. ınd money problems	ntexts, deciding which involving fractions and	<b>r operations and</b> I decimals to 2dp.	Estimate and use Estimate, compa money in pounds	inverse operations to check. re and calculate different measures, including ; and pence.

									Bar Model
Y5	Subtract whole numbers >4 digits, including using <b>formal</b> methods ( <b>columnar</b> <b>subtraction</b> ). Decimals up to 2dp. (eg. 72.5 - 45.7)	Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy. Solve multi-step problems in contexts, deciding which operations/methods to use and why.	Solve problems involving number up to 3dp. [Fractions] Solve problems involving converting between units of time. [Measurement] Solve problems involving measure [e.g. length, mass, volume, money] using decimal notation including scaling. [Measurement]	Dienes, place value counters. Counting on +4.3 +22.5 +5.7 = 26.8	<b>Taking away</b> (no number lin 72.5 - 45.7 72.5 - 40 = 32.5 - 5 = 27.5 - 0.7 =	1e) 32.5 27.5 26.8	Decomposi - <u>4 5.</u> 2 6.	ition. 72.5 - 45.7 = 26.8 <sup>15</sup> 7 8	Pupils practise subtracting decimals, including a mix of whole numbers and decimals, decimals with different numbers of decimal places, and complements of 1. Bar Model
Y6	Solve multi-step problems in contexts, deciding which operations/methods to use and why. Decimals up to 3dp (Context: Measures)	Use knowledge of the order of calculations involving subtra Use estimation to check answ determine, in the context of a degree of accuracy. Dienes, place value counters	rf operations to carry out action. vers to calculations and a problem, an appropriate	Solve problems which req be rounded to specified da accuracy. [ <i>Fractions</i> ] Solve problems involving and conversion of units of using decimal notation to appropriate. [ <i>Measuremen</i>	uire answers to grees of the calculation f measure, 3dp where 1	There was 2.5 litres in the jup m. How much was left 18.07 lbm - 3.243 hm. Solve addition and subtractic problems in contexts, decidin operations and methods to u Bar Model	p. He drank 385 m multi-step g which se and why.	Decomposition 72.5 - 45.7 = 26. $\frac{67.112.15}{2 - 6.8}$	8

	Statutory Expectations		MULTIPLICATION	
YR	Children solve problems, including doubling, halving and sharing. [Expected] Solve practical problems that involve combining groups of 2/5/10. [Exceeding]	Practical/ recorded using ICT (e.g. digital photos./ pictures on IWB) How many 10p coins are here? How much money is that? This domino is a double 4. How many spots does it have?	Pictures/Objects.	Symbolic 3 pairs, 2 socks in each pair:

٧I	Solve one-step problems using concrete objects, pictorial representations and arrays (with the support of the teacher)	Practical/recorded using ICT Pictures/Symbolic There are five cakes in each bag. How many cakes are there in three bace 2 Double sid Using nur number li repeated o problems pieces upo	sided counters umicon t line to solve d addition ts by laying upon track. 0 5 10 15 Bar model	Аттцуз. 5 x 2 or 2 x 5
Y2	Calculate statements for multiplication within the multiplication tables and write them using the multiplication and equals signs. [Show multiplication of two numbers can be done in any order.]	Pictures/Symbolic Pupils u variety of languag describe multipli How many apples in six boxes Bar mode	Repeated addition. The base of the sided counters of the sided c	Arruμs real life arrupe e.g. egg boxes

Y3	Write/calculate statements using the multiplication tables that they know (progressing to <b>formal</b> written methods). <b>TO x O</b> (multiplier is 2/3/4/5/8/10)	Make the Link between arrays and the grid meth Explicit X 10 7 70 7 70	hol. 3 $36 \times 4 = 144$ $\boxed{ \begin{array}{c} \times & 30 & 6 \\ \hline 4 & 120 & 24 \end{array}}$	36 x 4 = 144 30 x 4 = 120 6 x 4 = 24		$36 \times 4 = 144$ $36 \times \frac{4}{144}$ $\frac{144}{2}$	Pupils develop reliable writter TU by U (progressing to form	n methods for multiplication, starting with calculations of al written methods of short multiplication).
¥4	Use <b>formal</b> written layout: TO × 0 HTO × 0 Convert between different units of measure [eg km to m; hr to mi]	43 x 6 = 258 (estimate: 40 x 6 = 240) 40 x 6 = 240 3 x 6 = 18 Bar model	24 x	26 = 144 24 6 4 + 4 2 $5 \times 4 = 20$ $4 \times 5 = 20$	Using known to generate facts.	n facts 2 new	$342 \times 7 = 2394$ $3  4  2$ $\times  7$ $2  3  9  4$ $2  1$	
Y5	Use a <b>formal</b> written method (including long x for TO numbers) TO x TO HTO x O / HTO x TO ThHTO x O Convert between units of measure (eg.km/m; m/cm; cm/mm; kg/g; litre and ml)	$47 \times 36 = 1692$ (estimate 50 x 40 = 2000) $\frac{\times 40 7}{30 1200 210 1410}$ $\frac{6 240 42 282}{1692}$	Partition into 2 short multiplication sums as an interim step.	$2741 \times 6 = 16446$ (estimate 3000 x 6 = 2 7 4 1 × 6 1 6 4 4 6 18000	$24 \times 16 = 384$ $\begin{array}{r} 2 \\ 2 \\ 4 \\ -2 \\ 4 \\ -2 \\ 4 \\ -3 \\ 8 \\ 4 \end{array}$	(estimate 25 x 15 = 375)	$124 \times 26 = 3224 [see Y6]$ $1 2 4$ $\times 2 6$ $2 4 8 0$ $- 7 4 4$ $3 2 2 4$ $1 1$	Pupils connect multiplication by a fraction to using fractions as operators (fractions of), and to division. This relates to scaling by simple fractions, including those > 1. Find fractions of numbers and quantities, writing remainders as a fraction.

		Bar model						
¥6	Multi-digit numbers (up to 4 digits) x TU whole number using the <b>formal</b> method of <b>long multiplication</b> . Multiply one-digit numbers with up to two decimal places by whole numbers	Apply knowledge of patterns to variations. al place.	[NB See Y5 method]	$4.7 \times 8 = 37.6$ (estimate 5 x 8 = 40) $\times \frac{4.7}{\frac{8}{37.6}}$ [Or 47 x 8, then divide the solution by 10.] Bar model	5.65 x 9 = 50.85 (estimate 6 x 9 = 54) $\frac{x   5   0.6   0.05  }{9   45   5.4   0.45   50.85}$ [Or compute 565 x 9, then divide the solution by 100.]	Use a variety o fractions and # length is 36cm, x numbers with contexts).	f images to support understanding q to work backwards by x a quantity whole length 36 × 4 = 144cm). o up to 2dp by U/TU whole numbers	f x with fractions. Use understanding of relationship between unit that represents a unit fraction to find the whole quantity (eg if $\frac{1}{4}$ of a (starting with simplest cases e.g. 0.4 × 2 = 0.8, and in practical

	Statutory Expectations			DIVISION					
	Children solve problems, including doubling, halving and sharing. [Expected] They solve practical problems that involve sharing into equal groups. [Exceeding]	Practical / recorded I using. ICT (e.g. digital photos/pictures on IWB)	Pictures/Objects.	Symbolic 6 cakes shared between 2	There are 8 raisins. Take half of them. How many do you have?				
			69 (7)		Share the 10 grapes between 2 people.				
YR		only be used briefly, as a precursor to grouping, which is a more preferable method and should be moved on to as soon as possible. Solving division by grouping strengthens mental							
		calculation strategies.							
	Solve one-step problems using concrete objects, pictorial representations and arrays (with the support of the teacher)	Practical/recorded using ICT	Pictures/Symbolic	Visual (modelled using bead strings)					
		There are 14 people on th bus. Half of them get of	between 3 bowls?	15 ÷ 5 = 3					
Y1		bus?		00000 00000 00000					
		There are 20 people in th class. One quarter are boys. How many boys are there?		0 5	10 15				
					Double sided counters				

	Calculate statements within the	Pictures/Symbolic	Pupils use a	Visual	<u>^</u>	$\Delta \Delta \Delta A$	$\sim$	Arrays	Partitioning	
	multiplication tables and write		ummiatu al			<del>Y Y Y Y</del>	+	+		
	them using the division and		variety of	(modelled usina	bead strinas)					
	equals signs. [Show		language to		<i>a</i> ,					
	division of two numbers <u>cannot</u>	ers <u>cannot</u> Four eggs fit in a box.						Find $\frac{1}{4}$ of 24	22 · 2 = 16	
	be done in any order.]		divriation					-	52 - 2 - 10	
		How many boxes would you need to pack	k 20	18 ÷ 3 = 6	0	3 6 9	12 15	24 ÷ 4 = 6		
	Find $\frac{1}{3}$ , $\frac{1}{4}$ , $\frac{2}{4}$ , $\frac{3}{4}$ of a	eggs?		18						
	length/objects/quantity.							ŎŎŎŎŎŎ		
	Write simple fractions $eg \frac{1}{2}$ of 6			Counting on or b	ack.				$20 \div 2 = 10$	
	= 3							•••••		
12		AA AA AA AA A							$12 \div 2 = 6$	
			ă I							
			•				•			
				0 10 20 30 40 zero ten twenty thirty forty						
		$\bigcirc \bigcirc $	•••							
		Dauble sided caunters		Using Numic	con to model remaind	odel remainders.				
		Double sites courters								
	Write/calculate statements using	$96 \div 4 = 24$	Aultiples of the divisor)	Bar model		51 ÷ 3				
	the tables that they know	10 - 4 - 24	auples of the avisor)	bu mouer		= 17 17				
	(progressing to <b>formal</b> written	20 x /ı		3 children shared 18 between them. How each have?		0 54	— Рир	ipils develop reliable written methods for division, starting with calculations of TU by U numbers		
	methods).	4 x 4				r manu da theu		vogressing to formal written methods of short division).		
			35 ÷ 5 = 17							
	T0 ÷ 0									
				18						
Y3	(divisor is 2/3/4/5/8/10)									
		1	0 x 5 = 50							
			7 x 5 = 35							
		0 80								
		96		Double sided count	ers, cubes					
					,					
	Pupils practise to become fluent	Multiples of the 98 ÷ 7 = 14	<b>1 4</b> 252 ÷ 7	= 36	Bar model	ſ	252 ÷ 7 = 3	36		
	in the <b>formal</b> written method of	divisor Hundred Terns Ones	2							
	short division with exact		7 9 8							
	answers $[NS]$									
	10 : 0, 110 : 0		30 x 7 :	= 210				36		
		98 ÷ 7 = 14								
			6 x 7	= 42				1   232		
Y4			0							
					Double sided count	uble sided counters, cubes				
		10 x 7 = 70			Source Salet Courters, Cases					
		4 x 7 = 28								

Υ5	Use the <b>formal</b> written method of <b>short division</b> (interpret remainders appropriately for the context). <b>HTO + O</b> <b>THHTO + O</b> Convert between units of measure (eg km/m; m/cm; cm/mm; kg/g; litre and ml)	Bar model Double sided counters, cubes	Breaking up numbers. 291 ÷ 3 = 97 (estimate: 270 ÷ 3 = 90) $3\sqrt{290+1} = 3\sqrt{270+21}$ This is then shortened to: $\frac{97}{3\sqrt{29^21}}$	$432 \div 5 = 86 r^{2}$ $8 6 r^{2}$ $5 4 3 2$ (estimate: 400 ÷ 5 = 80)	8520 ÷ 6 = 1420 6 8520	Pupils connect x by a fraction to using fractions as operators (fractions of), and to ÷. This relates to scaling by simple fractions, incl. those > 1. Find fractions of numbers and quantities, writing remainders as a fraction.
¥6	Divide numbers (up to 4 digits) by TO whole number using the <b>formal</b> method of <b>short/long</b> <b>division</b> (interpret as approp. for the context). Use written division methods in cases where the and has up to 2dp.[Divide numbers. up to 2dp. by O/TO whole numbers.]	Bar model Double sided counters, cubes	43.68 ÷ 7 = 6.24 (estimate: 42 ÷ 7 = 6) [Or compute 4368 ÷ 7, then divide 6.24 7 43.68	the solution by 100.]	$496 + 11$ (estimate 500 ÷ 10 = 50) $4  5  r  1$ $1  1  4  9  6$ Answer: $45 \frac{1}{11}$	$432+15 = 28.8$ $1  5  \boxed{\begin{array}{c} 2 & 8 & 8 \\ 4 & 3 & 2 & 0 \\ \hline 3 & 0 \\ 1 & 3 & 2 \\ \hline 1 & 2 & 0 \\ \hline \end{array}}$