Calculation Policy

GREENFIELDS PRIMARY SCHOOL · YEARS 1 TO 6 · ADDITION, SUBTRACTION, MULTIPLICATION AND DIVISION

Six principles

1. CPA is not a staircase.

Concrete, pictorial and abstract run ALONGSIDE each other, not one after the other. Apparatus is available in every maths lesson to every child in every year group, including Year 6. It is not a signal that a child is struggling and it is never taken away as a reward.

2. The representation comes before the algorithm.

Every formal method is met first with apparatus, then as a picture, then as digits. Our plans already build this in — the first lesson of every method week is a REPRESENT lesson. That lesson is not optional and it is not the one to cut when time is short.

3. One method per operation per year.

Children are not asked to choose between competing layouts. Where a bridging method is used — expanded multiplication, chunking — it is taught deliberately as a bridge, laid out beside the formal method so pupils can see they are the same steps.

4. Say it before you write it.

Every method has a stem sentence, said aloud before it is recorded. ‘I exchange one ten for ten ones.’ ‘Four hundred and twenty-eight thousand, one hundred and fifty.’ A method a child cannot narrate is a method they cannot debug.

5. Estimate first. Check with the inverse.

From Year 3 upwards, every formal calculation is preceded by an estimate and followed by a check. An answer that is out by a factor of ten should never survive to the marking.

6. Move on when they can EXPLAIN, not when they are right.

A child is ready for the abstract when they can talk through the method with the apparatus in front of them. Correct answers alone are not evidence — a child can follow a procedure accurately for a fortnight and lose it entirely at the next exchange.

VOCABULARY WE USE, AND VOCABULARY WE DO NOT

EXCHANGE, not ‘borrow’ — nothing is borrowed and nothing is given back. REGROUP for addition, where ten ones become a ten. FEWER for countable things, not ‘less’. IS EQUAL TO for the = sign, not ‘makes’ or ‘the answer is’. DIVIDED BY, not ‘goes into’. These are used from Year 1 and they do not change as pupils move up the school.

Addition

YEARS 1 TO 6 · PROGRESSION, REPRESENTATION, LAYOUT AND COMMON ERRORS

HOW THIS PROGRESSION WORKS

Column addition arrives in Year 3 and goes STRAIGHT TO THE COMPACT METHOD, supported by apparatus rather than by an expanded written stage. Years 1 and 2 build the mental foundations; Years 4 to 6 extend the same layout to larger numbers and add the demand to choose between mental and written.

Year	What they meet	How we show it	How we write it	Watch for
1	Combine two groups. Count on from the larger number. Bonds to 10, then to 20. Bridge through ten.	Real objects, then counters. Ten frames — filled from the top left. Part-whole model. Number line, counting on.	*Numerals and symbols only. No column work.* 4 + 3 = 7 8 + 5 = 13 8 + 2 = 10, then + 3	Counting on from the first number rather than the larger. Counting the starting number as 'one'. Reading = as 'the answer is' rather than 'the same as'.
2	Add ones to a 2-digit number, crossing a ten. Add tens. Add two 2-digit numbers, with regrouping in the ones. Add three numbers, looking for a bond.	Base-ten rods and ones on a tens/ones mat. Bead string and number line. Part-whole model. Bar model for problems.	*Partitioned recording first, then columns with apparatus alongside.* 46 + 25 40 + 20 = 60 6 + 5 = 11 60 + 11 = 71 4 6 + 2 5 ——— 7 1 1	Forgetting to regroup ten ones into a ten. Writing 11 in the ones column. Adding the tens digits as single digits.
3	Mental methods with 3-digit numbers. Column addition, no regrouping. Regroup the ones, then the tens. Estimate first; check with the inverse.	Base-ten on a place-value grid — ALWAYS before the algorithm. Place-value counters for the exchange. Bar model for problems.	*Compact column method. The exchange is recorded UNDER the line.* 3 4 7 + 2 8 5 ——— 6 3 2 1 1	Columns not aligned by place value. Ten ones regrouped but never added on. The regrouped digit written above and then forgotten.
4	Add two 4-digit numbers with exchange. Mental round-and-adjust. Choose mental or written, and justify. Estimate, then check with the inverse.	Place-value counters for the first two lessons only. Bar model for two-step problems. Blank number line for round-and-adjust.	*Compact column method, several exchanges.* 3 4 2 6 + 2 1 5 8 ——— 5 5 8 4 1	Misaligning numbers with different digit counts. Reaching for columns when 4,997 + 1,998 is quicker mentally. Not estimating first, so an error of 1,000 goes unnoticed.

Year	What they meet	How we show it	How we write it	Watch for

5	Add numbers with more than four digits.
	Several exchanges across columns.
	Choose a degree of accuracy when estimating.
	Multi-step problems.
		Counters only for pupils still exchanging insecurely.
		Bar model for multi-step problems.
		Rounding on a number line.
			As Year 4, extended. Estimate written above the calculation.
			`  245 318`
			`+ 176 905`
			`―――――――――`
			`  422 223`
			`  1 1 1 1`
				Exchanges dropped when three or more happen in a row.
				Estimating to the wrong degree of accuracy.
				Column headings lost in a six-digit calculation.

6	All of the above, secured.
	Add mentally with large numbers where efficient.
	Order of operations.
	Multi-step problems with all four operations.
		Apparatus available on request, never withdrawn.
		Bar model for multi-step problems.
		Estimation as the first line of every calculation.
			As Year 5. The METHOD CHOICE is now assessed as well as the answer.
			`Estimate: 250 000 + 180 000`
			`          ≈ 430 000`
			`245 318 + 176 905 = 422 223`
				Using a written method where a mental one is quicker.
				No estimate, so a place-value error survives.
				Order of operations ignored in multi-step work.

Subtraction

YEARS 1 TO 6 · PROGRESSION, REPRESENTATION, LAYOUT AND COMMON ERRORS

HOW THIS PROGRESSION WORKS

As with addition, the compact column method arrives in Year 3 with apparatus alongside it. The exchange is always RECORDED — crossed out and rewritten — so that a pupil can see and check their own working. Exchange across a zero is the single hardest step in the primary curriculum and it gets a whole lesson in Year 4 and again in Year 5.

Year	What they meet	How we show it	How we write it	Watch for
1	Take away. Count back. Subtract on a number line. Bridge back through ten.	Real objects removed and counted. Ten frames. Number line, counting back. Part-whole with a part missing.	*Numerals and symbols only.* 7 - 3 = 4 13 - 5 = 8 13 - 3 = 10, then - 2	'One less' treated as counting on. Counting the starting number as the first step back. Subtracting the larger from the smaller.
2	Subtract ones, crossing a ten. Subtract tens. Subtract two 2-digit numbers with exchange from the tens. Use the inverse to check.	Base-ten on a tens/ones mat — the exchange done BY the child. Bead string. Bar model for difference.	*Apparatus, then partitioned recording, then columns.* 43 - 27 $^{3}4\ {}^{1}3$ - 2 7 ——— 1 6	Taking the smaller digit from the larger in each column. Exchanging but not reducing the tens. 'Borrowing' language — we say EXCHANGE.
3	Column subtraction, no exchange. Exchange a ten into the ones. Exchange a hundred into the tens. Spot and correct errors.	Base-ten on a place-value grid — ALWAYS before the algorithm. Place-value counters for the exchange. Bar model for difference.	*Compact method. Cross out and rewrite — no hidden exchanges.* $^{3}4\ {}^{1}2$ - 1 2 8 ——— 2 1 4	Smaller-from-larger in the ones column. Exchanging from the wrong column. The reduced digit not crossed out, so it is used twice.
4	4-digit subtraction with exchange. EXCHANGE ACROSS A ZERO. Choose mental or written. Find a difference.	Place-value counters for the zero case — non-negotiable. Bar model for difference and comparison.	*The zero case is taught as a chain of exchanges, not a trick.* $3\ {}^{3}/_{4}\ {}^{0}/_{9}\ {}^{1}/_{5}$ 3 4 0 5 - 1 2 6 8 ———— 2 1 3 7	Smaller-from-larger when a zero blocks the exchange. Exchanging straight from the hundreds without the chain. Answer not checked against the estimate.

Year	What they meet	How we show it	How we write it	Watch for

5	Subtract with several exchanges.
	Subtract from numbers with several zeros.
	Inverse to find missing numbers.
	Spot and correct errors.
		Counters for the multi-zero case.
		Bar model for multi-step problems.
			As Year 4, extended. 60,004 – 27,358 is the benchmark calculation.
			$^{5}/_{9}$ $^{0}/_{9}$ $^{0}/_{9}$ $^{0}/_{10}$ $^{4}/_{14}$
			`  6 0 0 0 4`
			`- 2 7 3 5 8`
			`___________`
			`  3 2 6 4 6`
				The exchange chain stopping at the first zero.
				Round-and-adjust ignored for 52,000 – 19,998.
				Errors surviving because no estimate was made.

6	All of the above, secured.
	Choose the most efficient method and justify it.
	Multi-step problems.
	Interpret answers in context.
		Apparatus available on request.
		Bar model for multi-step and comparison problems.
			Method choice is assessed. A correct column answer with no justification does not earn the mark where the question asks for one.
			`52 000 - 19 998`
			
			`52 000 - 20 000 = 32 000`
			`then + 2 → 32 002`
				Columns used where round-and-adjust is quicker.
				Remainders and differences not interpreted in context.
				No estimate.

Multiplication

YEARS 1 TO 6 · PROGRESSION, REPRESENTATION, LAYOUT AND COMMON ERRORS

HOW THIS PROGRESSION WORKS

Multiplication DOES use an expanded written stage, unlike addition and subtraction. The expanded layout in Year 4 and the area model in Years 5 and 6 are bridges: they are taught deliberately, laid out beside the formal method, and then let go. They are not an easier alternative for lower attainers to stay on.

Year	What they meet	How we show it	How we write it	Watch for
1	Make equal groups. Count in equal groups. Repeated addition. Double numbers to 10.	Real objects in hoops or on plates. Cubes in equal sticks. Number line jumps.	*Repeated addition only. No × symbol.* 3 groups of 2 2 + 2 + 2 = 6 double 4 = 8	Groups that are not equal. Counting the groups rather than the objects. Doubling by adding one.
2	Write repeated addition as ×. Arrays. Commutativity. 2, 5 and 10 times tables.	Arrays in counters and on squared paper. Number line jumps. Bar model for problems.	*The × symbol is introduced here, from an array.* ● ● ● ● ● ● ● ● ● ● 2 × 5 = 10 5 × 2 = 10	Reading an array one way only. 'Groups of' and 'lots of' used interchangeably without care. Tables recited but not linked to the array.
3	3, 4 and 8 times tables. Multiply 2-digit by 1-digit by partitioning. Then in a formal column layout. Scaling problems.	Base-ten to build the partition. Array on squared paper. Bar model for scaling.	*Partition first, then the compact column layout.* 24 × 3 20 × 3 = 60 4 × 3 = 12 60 + 12 = 72 2 4 × 3 ——— 7 2 1	Multiplying the ones and forgetting the tens. The carried digit added before multiplying. Partitioning abandoned before it is secure.

Year	What they meet	How we show it	How we write it	Watch for
4	All tables to 12 × 12. Expanded method, then formal. 3-digit × 1-digit with carrying. Numbers containing a zero.	Place-value counters in rows for the first lesson. Area model on squared paper. Bar model for scaling and correspondence.	*EXPANDED FIRST, then compact. The expanded step is not optional.* 2 4 3 × 6 1 8 (3 × 6) 2 4 0 (40 × 6) 1 2 0 0 (200 × 6) 1 4 5 8	Carrying into the wrong column. The carried digit added, then multiplied. A zero in the number skipped entirely.
5	4-digit × 1-digit short multiplication. Area model → expanded → long multiplication. 2-digit × 2-digit. Estimate the product first.	Area model on squared paper — the bridge to long multiplication. Place-value counters for the first representation lesson.	*Long multiplication. THE PLACEHOLDER ZERO IS WRITTEN, NOT IMPLIED.* 3 4 × 2 6 2 0 4 (34 × 6) 6 8 0 (34 × 20) 8 8 4	The placeholder zero missing, so the second row is out by a factor of ten. Partial products added before both are complete. No estimate, so a tenfold error survives.
6	3-digit × 2-digit and 4-digit × 2-digit. Area model → partial products → formal. Missing-digit problems. Multi-step problems.	Area model revisited whenever the method breaks down. Bar model for multi-step and ratio problems.	*As Year 5, extended. Estimate written above the calculation.* 3 4 2 × 2 6 2 0 5 2 (342 × 6) 6 8 4 0 (342 × 20) 8 8 9 2	Placeholder zero omitted. Rows misaligned so the addition is wrong. Estimate skipped on a calculation with four partial products.

Division

YEARS 1 TO 6 · PROGRESSION, REPRESENTATION, LAYOUT AND COMMON ERRORS

HOW THIS PROGRESSION WORKS

Sharing and grouping are taught as two different questions from Year 1 and both are needed. Short division arrives in Year 4 built from grouping with place-value counters. In Year 6, chunking is taught as the bridge to long division and laid out beside it on the same calculation — our Year 6 plan does this explicitly and it is the right approach.

Year	What they meet	How we show it	How we write it	Watch for

1	Share fairly between people.
	Group by size.
	Count how many groups.
	Halve an even number.
		Real objects shared onto plates.
		Cubes grouped into sticks.
		Number line jumps.
			No ÷ symbol. Spoken and practical only.
			`6 shared between 2`
			`→ 3 each`
			
			`half of 8 = 4`
				Sharing unequally and not noticing.
				Confusing ‘how many groups’ with ‘how many in each’.
				Halving by taking one away.

2	Divide by sharing and by grouping.
	The ÷ symbol.
	Division facts for 2, 5 and 10.
	Odd and even.
		Counters shared and grouped.
		Arrays read as division.
		Bar model for problems.
			The ÷ symbol is introduced here, from an array.
			`10 ÷ 2 = 5`
			`10 ÷ 5 = 2`
			
			`from the same array`
				Sharing and grouping treated as unrelated.
				Division assumed to be commutative.
				Facts recalled without a picture behind them.

3	Divide by sharing and grouping.
	Divide with a remainder.
	Interpret the remainder.
	Two-step problems.
		Counters grouped, remainder physically left over.
		Number line jumps.
		Bar model.
			Recorded as a number sentence with the remainder named.
			`13 ÷ 4 = 3 r 1`
			
			`3 groups of 4, and`
			`1 left over`
				A remainder larger than the divisor.
				The remainder ignored in a word problem.
				Grouping abandoned for guesswork.

4	Share, then group, then SHORT DIVISION.
	2- and 3-digit ÷ 1-digit.
	Remainders interpreted in context.
	Factor pairs.
		Place-value counters grouped column by column — the bridge to short division.
		Bar model for problems.
			Short division. The exchange is carried into the next column and WRITTEN.
			`    0 6 4 r 2`
			`────────────`
			`4 ) 2 ²5 8`
			
			`258 ÷ 4 = 64 r 2`
				Remainder larger than the divisor.
				The carried digit written but not used.
				Remainder always rounded up, whatever the context.

5	4-digit ÷ 1-digit short division.
	Zeros in the quotient.
	Express the remainder.
	Interpret in context.
		Counters for pupils still insecure on the exchange.
		Bar model for scaling and rate problems.
			Short division. A zero in the quotient is WRITTEN, never skipped.
			`    0 8 0 3`
			`────────────`
			`4 ) 3 ³2 1 2`
			
			`3212 ÷ 4 = 803`
				The zero in the quotient dropped, so the answer is out by a factor of ten.
				Remainder expressed the same way regardless of context.
				No estimate.

Year	What they meet	How we show it	How we write it	Watch for

6	Short division secured.
	CHUNKING as the bridge to long division.
	4-digit ÷ 2-digit long division.
	Remainder as whole, fraction or decimal.
		Multiples list written out before dividing.
		Chunking laid out ALONGSIDE long division, same calculation.
		Bar model for multi-step problems.
			Long division. Divide, multiply, subtract, bring down. Build a multiples list first.
			`Multiples of 15:`
			`15 30 45 60 75 …`
			`0 4 5`
			`———————`
			`15 ) 6 7 5`
			`6 0`
			`———`
			`7 5`
			`7 5`
			`———`
			`0`
				Long division taught as four steps with no meaning behind them.
				Remainder larger than the divisor.
				Remainder form not matched to the context.

Representations

THE PICTURES WE USE, AND WHAT EACH ONE IS FOR

Representation	Years	What it is for
Ten frame	Years 1–2	Filled from the top left, ALWAYS, so a number looks the same every time. The empty spaces matter as much as the counters.
Base-ten (Dienes)	Years 2–5	For building numbers and for exchange. The rod is visibly ten times the cube, which does some of the thinking — useful when teaching exchange, unhelpful when teaching the value of a digit.
Place-value counters	Years 3–6	Identical in every column, so ONLY the column can tell you the value. Use these, not base-ten, whenever the lesson is about what a digit is worth.
Part-whole model	Years 1–6	For partitioning, including non-standard partitioning. The foundation of column subtraction with exchange.
Array	Years 2–4	For multiplication, commutativity and the link to division. Read both ways, every time.
Area model	Years 5–6	The bridge to long multiplication. Return to it whenever the formal method breaks down.
Number line	Years 1–6	For counting on and back, bridging, rounding, and round-and-adjust. Marked in Years 1–3; blank from Year 4.
Bar model	Years 1–6	OUR PROBLEM-SOLVING REPRESENTATION. Used for difference, comparison, scaling, ratio and every multi-step problem, from Year 1 to Year 6.

The five calculations every teacher should be able to model

If a member of staff can teach these five with apparatus and narrate every step, they can teach the whole policy. They are the calculations where the method is most likely to become a trick.

Year	Calculation	Why this one
Year 2	`43 - 27`	Exchange one ten for ten ones, done by the child.
Year 3	`342 - 128`	The first exchange in a column layout.
Year 4	`3,405 - 1,268`	Exchange across a zero — a chain, not a trick.
Year 5	`34 × 26`	Long multiplication, and why the placeholder zero is there.
Year 6	`675 ÷ 15`	Chunking laid beside long division — the same steps.