

Trentside Approach to Maths



Infinity Academies Trust

Ready to learn; Prepared to flourish.

Vision for Maths

At Trentside, we deliver a maths curriculum that enables our pupils to develop the knowledge, skills, and confidence they need to become capable, resilient mathematicians. Our mathematics curriculum incorporates a mastery approach which is based around well-sequenced schemes of learning; key concepts are revisited frequently throughout the year and built upon progressively in each academic year in line with National Curriculum expectations.

Pupils engage with high-quality mathematical tasks and representations that are chosen for their challenge, relevance, ensuring that all pupils have the best opportunities to build secure mathematical understanding. Concepts and activities are selected to support pupils in widening their mathematical vocabulary and understanding so they can: access an increasingly broad range of mathematical concepts, make links between methods and representations, develop fluency in key skills, and strengthen their reasoning and problem-solving abilities.

In the Classroom

EYFS use the NCETM Mastering Number programme, which is then continued into KS1 as a daily fluency activity. From Year 1 to Year 6, pupils follow the White Rose curriculum, enhanced with additional resources to further embed key concepts when needed. From Year 2 onwards, times tables are also built into our daily lessons. Lessons finish with a plenary involving a modelled and a paired/independent problem-solving question to ensure all pupils have the opportunity to access these questions. Through immersion in a rich variety of mathematical representations, problems, and real-life contexts, our pupils become confident, reflective thinkers and effective problem-solvers. Pupils also access a wide range of mathematical manipulatives, visual models, and high-quality practical and written tasks, all of which are used to inspire, deepen, and enhance learning beyond explicit maths lessons. Mathematical vocabulary for each year group is outlined in the progression document. This is on display on working walls and used consistently by staff and pupils. A 'ping pong' style of questioning is used to ensure that pupils are engaged, and discussions go back and forth. New topics will be introduced with a 'why?' to ensure pupils understand the real-world applications of their learning.

Inclusion and SEND

All pupils are entitled to access a broad and balanced maths curriculum. Teachers use adaptive teaching strategies to ensure that every learner can succeed, scaffolding learning appropriately and providing visual or practical support when needed. Key mathematical vocabulary is consistently used when new topics are introduced, so that pupils can build upon this knowledge as they progress through the year groups, while meaningful challenge is planned for those working at greater depth to enable all pupils to think deeply and advance confidently in their mathematical learning.

Teaching and Learning Expectations

EYFS:

Main Lesson (<i>x4 per week + 1 consolidation / provision lesson</i>) Mastery of Number (NCETM) based using White Rose Maths to supplement.

Key Stage 1:

Fluency Mastery of Number (NCETM)

Times Tables (Year 2 only) Following times tables progression document
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Main Lesson White Rose Maths Curriculum

Plenary Class Discussion (Y1) A modelled and an independent problem-solving question (Y2)

Key Stage 2:

Fluency Flashback 4 (Y3, Y4, Y5, Y6) Third-Space Learning Daily Arithmetic (Year 6 for SATs preparation)
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Times Tables Following times tables progression document
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Main Lesson White Rose Maths Curriculum

Plenary A modelled and an independent problem-solving question
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Assessment

Pupil outcomes are monitored daily, with feedback provided to pupils to support their progress in maths. Questioning within lessons is targeted at class and pupil need based on prior learning. Pupils are formally assessed termly using NFER testing (Years 2-5) or through past SATs papers (Year 6). These are analysed to focus future learning and ensure learning is needs-driven. The fluency part of the lesson structure allows time for any previous learning to be revisited if there are areas in which pupils' knowledge is not secure from assessments. Year 4 are also assessed weekly using TT Rockstars in preparation for the MTC. Progress in Year 1 is measured using the end of topic assessments from White Rose. All pupils complete these assessments after their following unit of work to ensure it is assessing their ability to recall the information they have previously learnt. In the following year group, pupils who were not secure in a unit of work will access pre-learning to ensure they are 'catching up' as well as 'keeping up.' One minute maths assessments are carried out at the beginning and end of every half term (Year 2-6) to assess mental arithmetic fluency. Pupils with critically low scores are identified as needing support with their key number facts.

EYFS

Maths progress is measured at the end of the academic year using the early learning goals.

Monitoring

Monitoring of teaching and learning is carried out by the Maths subject leader alongside SLT to ensure quality provision for learners on an ongoing basis. Feedback is provided to staff to ensure provision for maths meets the needs of all pupils and ensures progress is maximised. Monitoring will be carried out using a variety of approaches: lesson visits, learning walks, lesson observations, pupil voice, book looks and data analysis.

Maths Resources

- White Rose Maths
- National Oak Academy
- NCETM
- TT Rockstars
- Third Space Learning (Arithmetic)
- www.maths.co.uk (Year 6)

Curriculum Planning and Progression

Year 1:

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number Place value (within 10) FREE TRIAL VIEW					Number Addition and subtraction (within 10) VIEW				Geometry Shape VIEW	Consolidation	
Spring	Number Place value (within 20) VIEW		Number Addition and subtraction (within 20) VIEW		Number Place value (within 50) VIEW		Measurement Length and height VIEW	Measurement Mass and volume VIEW				
Summer	Number Multiplication and division VIEW		Number Fractions VIEW	Geometry Position and direction VIEW	Number Place value (within 100) VIEW		Measurement Money VIEW	Measurement Time VIEW		Consolidation		

Year 2:

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number Place value FREE TRIAL VIEW				Number Addition and subtraction VIEW				Geometry Shape VIEW			
Spring	Measurement Money VIEW		Number Multiplication and division VIEW				Measurement Length and height VIEW		Measurement Mass, capacity and temperature VIEW			
Summer	Number Fractions VIEW			Measurement Time VIEW			Statistics VIEW		Geometry Position and direction VIEW		Consolidation	

Year 3:

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number Place value FREE TRIAL VIEW			Number Addition and subtraction VIEW				Number Multiplication and division A VIEW				
Spring	Number Multiplication and division B VIEW			Measurement Length and perimeter VIEW		Number Fractions A VIEW			Measurement Mass and capacity VIEW			
Summer	Number Fractions B VIEW		Measurement Money VIEW		Measurement Time VIEW			Geometry Shape VIEW		Statistics VIEW		Consolidation

Year 4:

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12		
Autumn	Number Place value FREE TRIAL VIEW				Number Addition and subtraction VIEW		Measurement Area VIEW		Number Multiplication and division A VIEW		Consolidation			
Spring	Number Multiplication and division B VIEW			Measurement Length and perimeter VIEW		Number Fractions VIEW			Number Decimals A VIEW					
Summer	Number Decimals B VIEW		Measurement Money VIEW		Measurement Time VIEW		Consolidation		Geometry Shape VIEW		Statistics VIEW		Geometry Position and direction VIEW	

Year 5:

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number Place value FREE TRIAL VIEW		Free trial	Number Addition and subtraction VIEW		Number Multiplication and division A VIEW			Number Fractions A VIEW			
Spring	Number Multiplication and division B VIEW			Number Fractions B VIEW		Number Decimals and percentages VIEW			Measurement Perimeter and area VIEW		Statistics VIEW	
Summer	Geometry Shape VIEW			Geometry Position and direction VIEW		Number Decimals VIEW			Number Negative numbers VIEW	Measurement Converting units VIEW	Measurement Volume VIEW	

Year 6:

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number Place value FREE TRIAL VIEW	Free trial	Number Addition, subtraction, multiplication and division VIEW				Number Fractions A VIEW	Number Fractions B VIEW	Measurement Converting units VIEW			
Spring	Number Ratio VIEW	Number Algebra VIEW	Number Decimals VIEW	Number Fractions, decimals and percentages VIEW	Measurement Area, perimeter and volume VIEW	Statistics VIEW						
Summer	Geometry Shape VIEW		Geometry Position and direction VIEW	Themed projects, consolidation and problem solving VIEW								

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number Place value (within 20) FREE TRIAL VIEW			Number Addition and subtraction (within 20) VIEW		Number Place value (within 100) VIEW			Geometry Shape VIEW			
Spring	Number Addition and subtraction (within 100) VIEW			Number Multiplication and division VIEW			Measurement Length and height VIEW		Statistics VIEW	Consolidation		
Summer	Measurement Money VIEW	Number Fractions VIEW		Measurement Time VIEW		Measurement Mass, capacity and temperat... VIEW		Geometry Position and direction VIEW	Consolidation			

Year 3/4

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number Place value FREE TRIAL VIEW				Number Addition and subtraction VIEW				Number Multiplication and division A VIEW			Measurement Area VIEW
Spring	Number Multiplication and division B VIEW		Measurement Length and perimeter VIEW		Number Fractions A VIEW			Measurement Mass and capacity VIEW		Number Fractions B VIEW		
Summer	Measurement Time VIEW	Number Decimals VIEW			Measurement Money VIEW	Geometry Shape VIEW		Geometry Position and direction VIEW	Statistics VIEW			

Year 5/6

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number Place value FREE TRIAL VIEW		Free trial	Number Addition and subtraction VIEW	Number Multiplication and division A VIEW		Number Fractions A VIEW				Number Multiplication and division B VIEW	
Spring	Number Multiplication and division B continued VIEW	Number Fractions B VIEW	Number Decimals A VIEW	Measurement Area, perimeter and volume VIEW		Number Decimals B VIEW					Number Fractions, decimals and percentages VIEW	
Summer	Ratio VIEW	Algeb... VIEW		Geometry Shape VIEW		Geometry Position and direction VIEW		Statistics VIEW			Measurement Converting units VIEW	

Times Tables Progression

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Year 2	Multiplication facts up to 12×2	Multiplication facts up to 12×5	Multiplication facts up to 12×10 Division facts up to $120 \div 10$	Multiplication facts up to 12×2 Division facts up to $120 \div 2$	Multiplication facts up to 12×5 Division facts up to $120 \div 5$	Multiplication facts up to 12×3
Year 3	Multiplication facts up to 12×3 Division facts up to $36 \div 3$	Multiplication facts up to 12×4 Division facts up to $48 \div 4$	Multiplication and division facts for 2, 3, 4, 5 and 10	Multiplication facts up to 12×6 Division facts up to $72 \div 6$ (Double 3x table).	Multiplication facts up to 12×8 Division facts up to $96 \div 8$ (Double 4x table).	Multiplication and division facts for 2, 3, 4, 5, 6, 8 and 10
Year 4	Multiplication facts up to 12×9 Division facts up to $108 \div 9$	Multiplication facts up to 12×11 Division facts up to $132 \div 11$	Multiplication facts up to 12×12 Division facts up to $144 \div 12$	Multiplication facts up to 12×7 Division facts up to $84 \div 7$	All multiplication and division facts up to 12×12	
Year 5	Weekly Focus 2, 5, 10, 3, 4, 6, 8, 9, 11, 12 and 7		Related Facts Multiply by 10		Related Facts Multiply by 100	
Year 6	Related Facts Decimals ($\div 10$)		Related Facts Percentages		Consolidation Times Table Games	

Times Tables Fluency

	Monday	Tuesday	Wednesday	Thursday	Friday
Year 2	Counting Stick TTRS Column	Counting Stick TTs Song	Counting Stick TTRS Column	Counting Stick TTs Song	Counting Stick TTRS Column
Year 3	TTs Song Counting Stick TTRS Column	TTs Song Counting Stick TTRS Column	TTs Song Counting Stick TTRS Column	TTs Song Counting Stick TTs Games	TTs Song Counting Stick TTs Games
Year 4	TTs Song Counting Stick TTRS Column	TTs Song Counting Stick TTRS Column	TTs Song Counting Stick TTRS Column	TTs Song Counting Stick TTs Games	TTs Song Counting Stick TTs Games
Year 5	iPads (TTRS)	Counting Stick TTRS Multiplication	Counting Stick TTRS Division	Counting Stick TTRS Missing Number	iPads (TTRS)
Year 6	Counting Stick TTRS Multiplication	iPads (TTRS)	Counting Stick TTRS Division	iPads (TTRS)	Counting Stick TTRS Missing Number

***Year 4 to access TTRS each day for 10 mins on iPads until MTC.**

Autumn Term – Garage daily and 1x Soundcheck per week.

Spring Term – 1x Soundcheck daily and then Garage.

Times Tables Fluency

	Monday	Tuesday	Wednesday	Thursday	Friday
Class 2	Counting Stick TTs Song	Counting Stick TTs Song	Counting Stick TTs Song	Counting Stick TTs Song	Counting Stick TTs Song
Class 3	TTs Song Counting Stick TTRS Column	TTs Song Counting Stick TTRS Column	TTs Song Counting Stick TTRS Column	TTs Song Counting Stick TTs Games	TTs Song Counting Stick TTs Games
Class 4	Counting Stick TTRS Multiplication	iPads (TTRS)	Counting Stick TTRS Division	iPads (TTRS)	Counting Stick TTRS Missing Number

***Class 3 to access TTRS each day for 10 mins on iPads until MTC.**

Autumn Term – Garage daily and 1x Soundcheck per week.

Spring Term – 1x Soundcheck daily and then Garage.

Times Tables Fluency

	Monday	Tuesday	Wednesday	Thursday	Friday
Year 1/2	Counting Stick TTs Song	Counting Stick TTs Song	Counting Stick TTs Song	Counting Stick TTs Song	Counting Stick TTs Song
Year 3/4	TTs Song Counting Stick TTRS Column	TTs Song Counting Stick TTRS Column	TTs Song Counting Stick TTRS Column	TTs Song Counting Stick TTs Games	TTs Song Counting Stick TTs Games
Year 5/6	Counting Stick TTRS Multiplication	iPads (TTRS)	Counting Stick TTRS Division	iPads (TTRS)	Counting Stick TTRS Missing Number

***Year 3/4s to access TTRS each day for 10 mins on iPads until MTC.**

Autumn Term – Garage daily and 1x Soundcheck per week.

Spring Term – 1x Soundcheck daily and then Garage.



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Ready to learn, Prepared to flourish

St Martin's



Church of England
Primary Academy



Haxey CE Primary Academy

St Martin's CE Primary Academy

West Butterwick CE Primary Academy

West Butterwick



Church of England
Primary Academy

Mathematics Calculation Policy

KS1 & KS2

Summary

This calculation policy has been devised to support in understanding both the expectations for fluency of the 2014 curriculum and the progression of calculation concepts through a child's mathematical development.

Principles

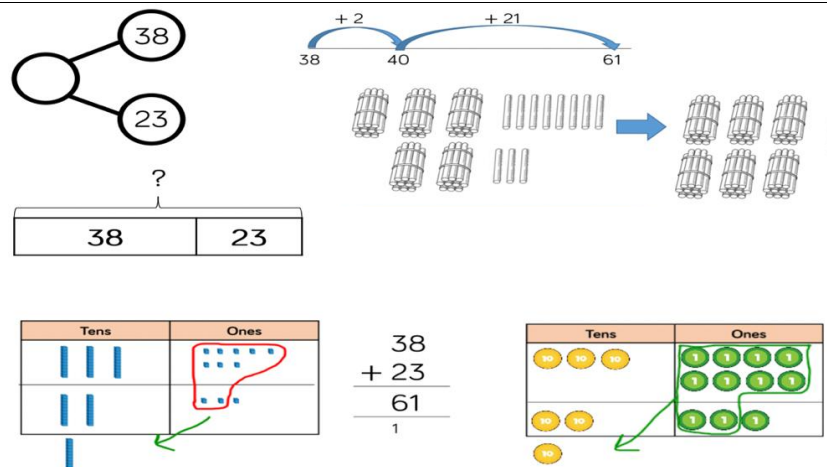
- This calculation policy is focused on developing proficiency with the expected formal written methods by the end of Year 6 as exemplified on the National Curriculum Appendix document.
- Specific practical equipment and approaches have been suggested for each age group based on the White Rose Maths programme. These are designed to support children in developing the conceptual understanding that will enable them to move more rapidly and efficiently towards the formal written methods expected.

Addition

Year Group	Skill	Visual Representations	Formal Written Method / Presentation	Key Vocabulary
1	Add 1-Digit Numbers within 10		$\boxed{4} \boxed{+} \boxed{3} \boxed{=} \boxed{7}$	add plus total more altogether sum
	When adding numbers to 10, children can explore both aggregation and augmentation. The part-whole model, discrete and continuous bar model, number shapes and ten frame support aggregation. The combination bar model, ten frame, bead string and number track all support augmentation.			
	Add 1 and 2-Digit Numbers to 20		$\boxed{8} \boxed{+} \boxed{7} \boxed{=} \boxed{15}$	add plus total more altogether sum

		When adding one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten. Different manipulatives can be used to represent this exchange. Use concrete resources alongside number lines to support children in understanding how to partition their jumps		
2	Add 3 1-Digit Numbers		$\boxed{7 + 6 + 3 = 15}$	add plus total more altogether sum increase
		When adding three 1-digit numbers, children should be encouraged to look for number bonds to 10 or doubles to add the numbers more efficiently. This supports children in their understanding of commutativity. Manipulatives that highlight number bonds to 10 are effective when adding three 1-digit numbers.		
	Add 1-Digit And 2-Digit Numbers to 100		$\boxed{38 + 5 = 43}$	add plus total more altogether sum increase
		When adding single digits to a two-digit number, children should be encouraged to count on from the larger number. They should also apply their knowledge of number bonds to add more efficiently e.g. $8 + 5 = 13$ so $38 + 5 = 43$		

**Add
2-Digit
Numbers
to 100**



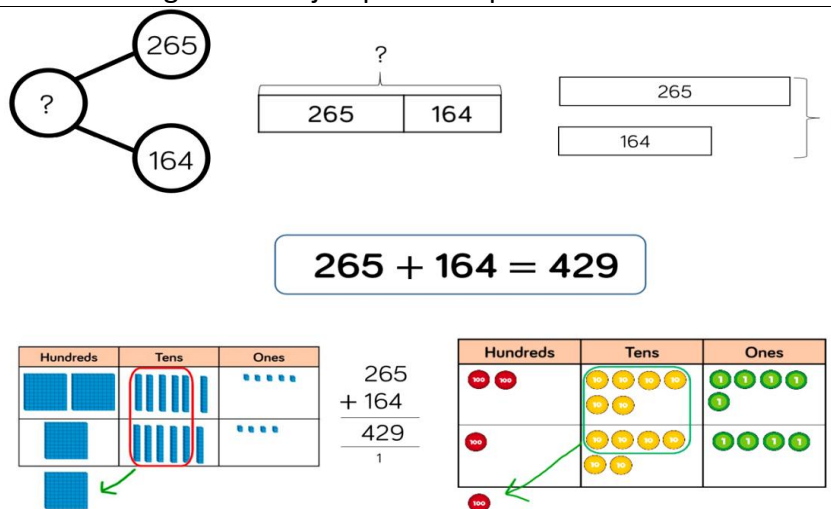
	3	8
+	2	3
	6	1
	1	

**add
plus
total
more
altogether
sum
increase
exchange
carry**

At this stage, encourage children to use the formal column method when calculating alongside straws, base 10 or place value counters. As numbers become larger, straws become less efficient. Children can also use a blank number line to count on to find the total. Encourage them to jump to multiples of 10 to become more efficient.

3

**Add
Numbers
with up to
3 Digits**



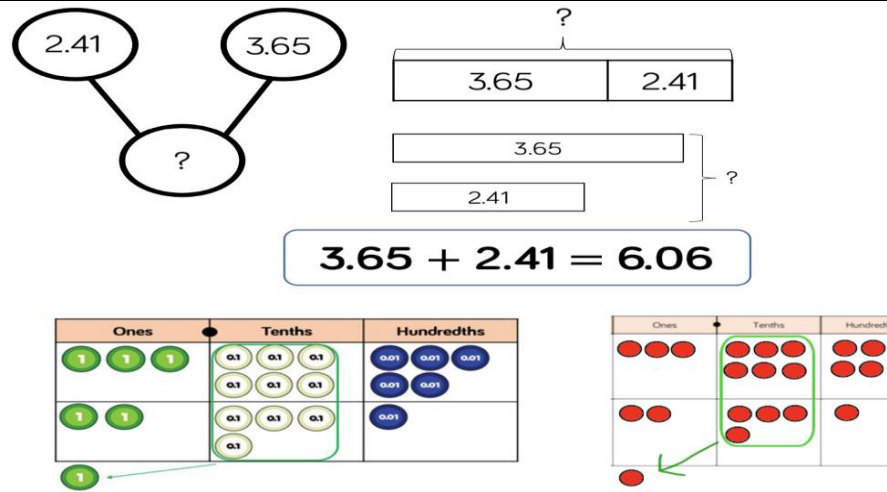
	2	6	5	
+	1	6	4	
	4	2	9	
	1			

**add
plus
total
more
altogether
sum
increase
exchange
carry**

Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 3 digits. Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method. Plain counters on a place value grid can also be used to support learning.

4	Add Numbers with up to 4 Digits	1,378 ? 2,148 ? 2,138 1,378 2,138 1,378 1,378 + 2,148 = 3,526 <table><tr><th>Thousands</th><th>Hundreds</th><th>Tens</th><th>Ones</th></tr><tr><td></td><td></td><td></td><td></td></tr></table><table><tr><th>Thousands</th><th>Hundreds</th><th>Tens</th><th>Ones</th></tr><tr><td></td><td></td><td></td><td></td></tr></table> <table><tr><td></td><td>1</td><td>3</td><td>7</td><td>8</td><td></td></tr><tr><td>+</td><td>2</td><td>1</td><td>4</td><td>8</td><td></td></tr><tr><td></td><td>3</td><td>5</td><td>2</td><td>6</td><td></td></tr><tr><td></td><td></td><td>1</td><td>1</td><td></td><td></td></tr></table> add plus total more altogether sum increase exchange carry column addition	Thousands	Hundreds	Tens	Ones					Thousands	Hundreds	Tens	Ones						1	3	7	8		+	2	1	4	8			3	5	2	6				1	1			Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 4 digits. Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method. Plain counters on a place value grid can also be used to support learning.																
Thousands	Hundreds	Tens	Ones																																																								
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	1	3	7	8																																																							
+	2	1	4	8																																																							
	3	5	2	6																																																							
		1	1																																																								
5	Add Numbers with more than 4 Digits	? 104,328 61,731 104,328 61,731 104,328 + 61,731 = 166,059 <table><tr><th>HTh</th><th>TTh</th><th>Th</th><th>H</th><th>T</th><th>O</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table><table><tr><th>HTh</th><th>TTh</th><th>Th</th><th>H</th><th>T</th><th>O</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> <table><tr><td></td><td>1</td><td>0</td><td>4</td><td>3</td><td>2</td><td>8</td><td></td></tr><tr><td>+</td><td></td><td>6</td><td>1</td><td>7</td><td>3</td><td>1</td><td></td></tr><tr><td></td><td>1</td><td>6</td><td>6</td><td>0</td><td>5</td><td>9</td><td></td></tr><tr><td></td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td></tr></table> add plus total more altogether sum increase exchange carry column addition	HTh	TTh	Th	H	T	O							HTh	TTh	Th	H	T	O								1	0	4	3	2	8		+		6	1	7	3	1			1	6	6	0	5	9					1					Place value counters or plain counters on a place value grid are the most effective concrete resources when adding numbers with more than 4 digits. At this stage, children should be encouraged to work in the abstract, using the column method to add larger numbers efficiently.
HTh	TTh	Th	H	T	O																																																						
HTh	TTh	Th	H	T	O																																																						
	1	0	4	3	2	8																																																					
+		6	1	7	3	1																																																					
	1	6	6	0	5	9																																																					
			1																																																								

Add With
up to 3
Decimal
Places

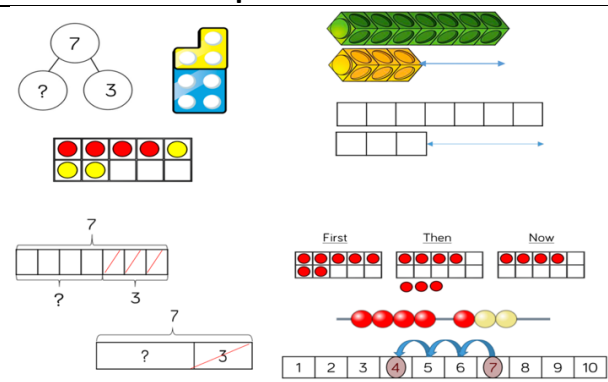
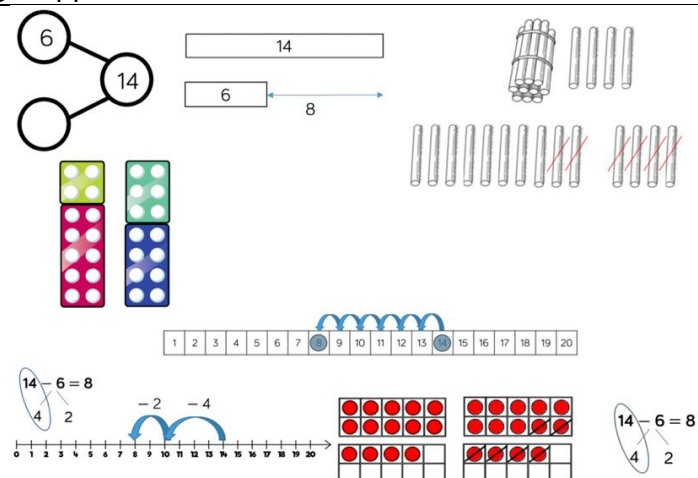


	3	.	6	5	
+	2	.	4	1	
	6	.	0	6	
	1				

add
plus
total
more
altogether
sum increase
exchange
carry
column addition

Place value counters and plain counters on a place value grid are the most effective manipulatives when adding decimals with 1, 2 and then 3 decimal places. Ensure children have experience of adding decimals with a variety of decimal places. This includes putting this into context when adding money and other measures.

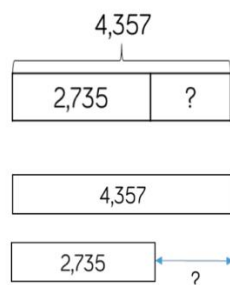
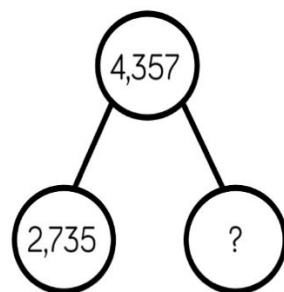
Subtraction

Year Group	Skill	Visual Representations	Formal Written Method	Key Vocabulary						
1	Subtract 1-Digit Numbers within 10		<table><tr><td>7</td><td>-</td><td>3</td><td>=</td><td>4</td></tr></table>	7	-	3	=	4	subtract take away less fewer difference	
	7	-	3	=	4					
Part-whole models, bar models, ten frames and number shapes support partitioning. Ten frames, number tracks, single bar models and bead strings support reduction. Cubes and bar models with two bars can support finding the difference.										
1	Subtract 1 and 2-Digit Numbers to 20		<table><tr><td>1</td><td>4</td><td>-</td><td>6</td><td>=</td><td>8</td></tr></table>	1	4	-	6	=	8	subtract take away less fewer difference
1	4	-	6	=	8					
When subtracting one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten. Children should be encouraged to find the number bond to 10 when partitioning the subtracted number. Ten frames, number shapes and number lines are particularly useful for this.										

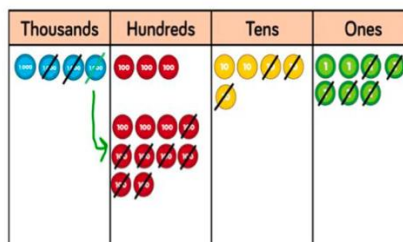
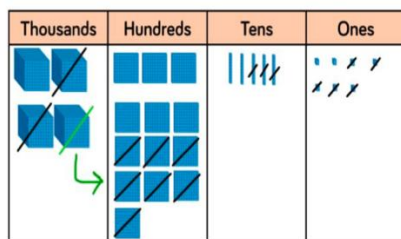
2	Subtract 1 and 2-Digit Numbers to 100	65 28 28 30 60 65 65 28 ? 28 65 - 28 = 37 Tens Ones Tens Ones 435 273 ? 435 273 ? 435 - 273 = 262 Hundreds Tens Ones Hundreds Tens Ones	5 1 6 5 - 2 8 3 7 3 1 4 3 5 - 2 7 3 1 6 2	subtract take away less fewer difference decrease
3	Subtract Numbers with up to 3 Digits	435 273 ? 435 273 ? 435 - 273 = 262 Hundreds Tens Ones Hundreds Tens Ones	3 1 4 3 5 - 2 7 3 1 6 2 3 1 4 3 5 - 2 7 3 1 6 2	subtract take away less fewer difference decrease exchange carry
		At this stage, encourage children to use the formal column method when calculating alongside straws, base 10 or place value counters. As numbers become larger, straws become less efficient. Children can also use a blank number line to count on to find the difference. Encourage them to jump to multiples of 10 to become more efficient.		
		Base 10 and place value counters are the most effective manipulative when subtracting numbers with up to 3 digits. Ensure children write out their calculation alongside any concrete resources so they can see the links to their written column method. Plain counters on a place value grid can also be used to support learning.		

4

**Subtract
Numbers
with up
to 4
Digits**



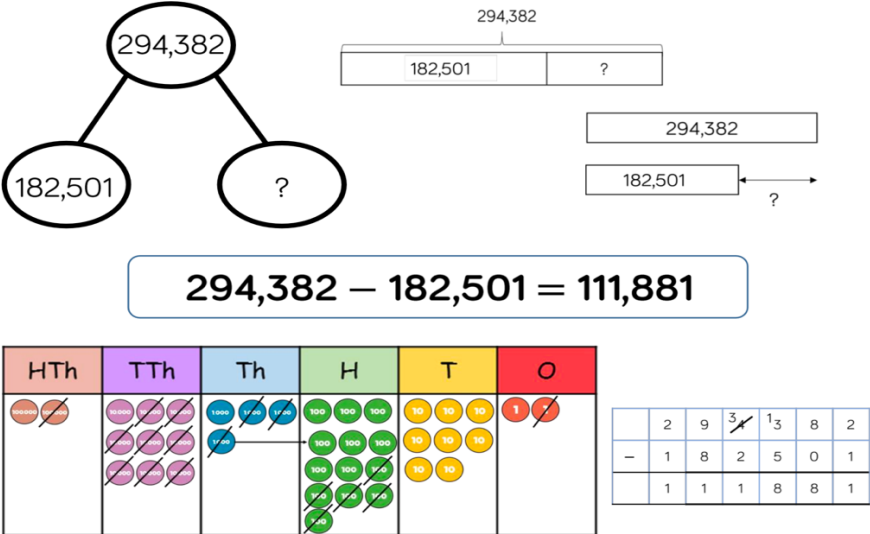
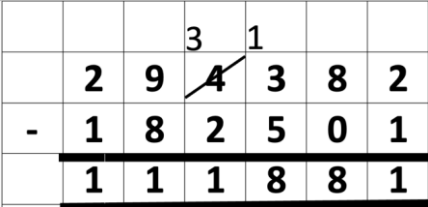
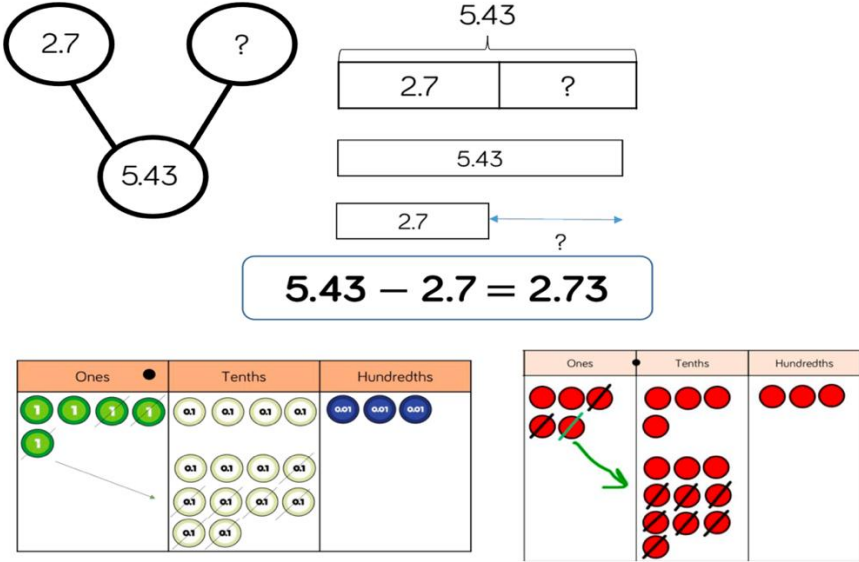
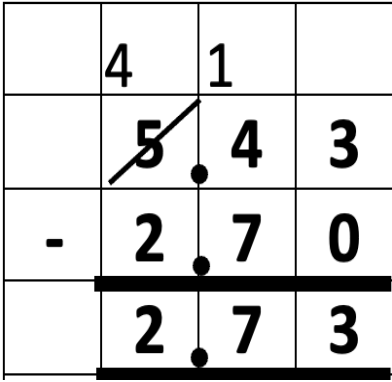
$$4,357 - 2,735 = 1,622$$



	3	1		
	~~4~~	3	5	7
-	2	7	3	5
	1	6	2	2

**subtract
take away
less
fewer
difference
decrease
exchange
borrow
column
subtraction**

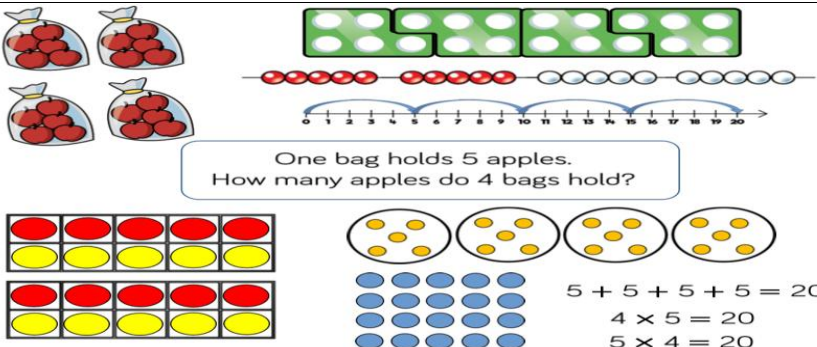
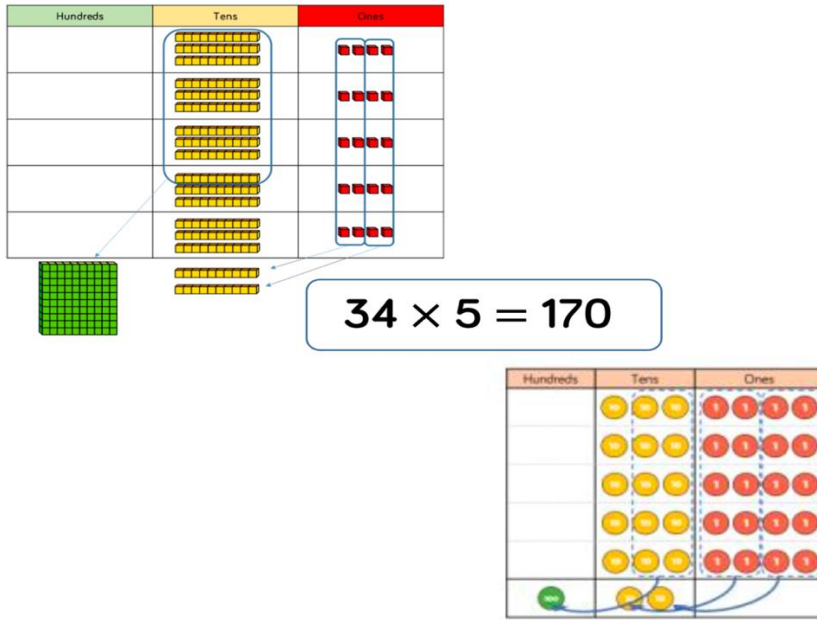
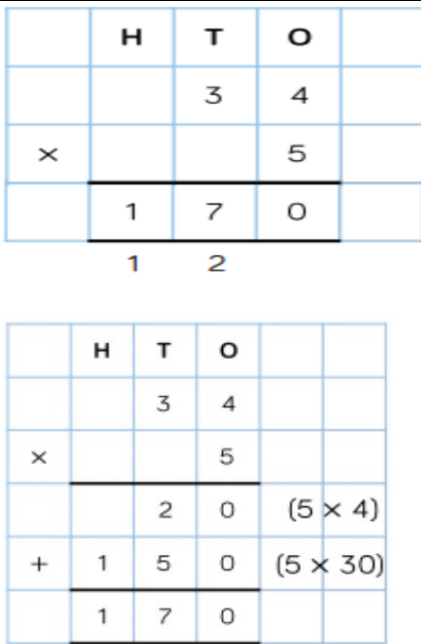
Base 10 and place value counters are the most effective manipulatives when subtracting numbers with up to 4 digits. Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method. Plain counters on a place value grid can also be used to support learning.

5	Subtract Numbers with more than 4 Digits	 294,382 182,501 ? 294,382 182,501 ? 294,382 – 182,501 = 111,881 Place value grid showing the subtraction of 182,501 from 294,382. The grid has columns: HTh, TTh, Th, H, T, O. The numbers are represented by place value counters. The difference is 111,881.		subtract take away less fewer difference decrease exchange borrow column subtraction
5	Subtract with up to 3 Decimal Places	 2.7 ? 5.43 2.7 ? 5.43 – 2.7 = 2.73 Place value grid showing the subtraction of 2.7 from 5.43. The grid has columns: Ones, Tenths, Hundredths. The numbers are represented by place value counters. The difference is 2.73.		subtract take away less fewer difference decrease exchange borrow column subtraction

Place value counters or plain counters on a place value grid are the most effective concrete resource when subtracting numbers with more than 4 digits. At this stage, children should be encouraged to work in the abstract, using column method to subtract larger numbers efficiently.

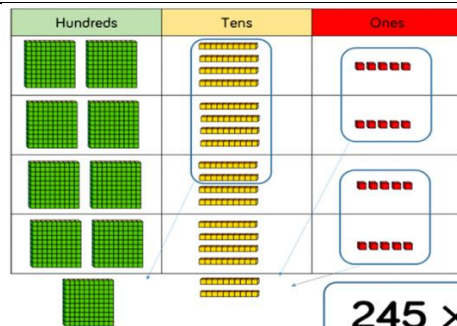
Place value counters and plain counters on a place value grid are the most effective manipulative when subtracting decimals with 1, 2 and then 3 decimal places. Ensure children have experience of subtracting decimals with a variety of decimal places. This includes putting this into context when subtracting money and other measures.

Multiplication

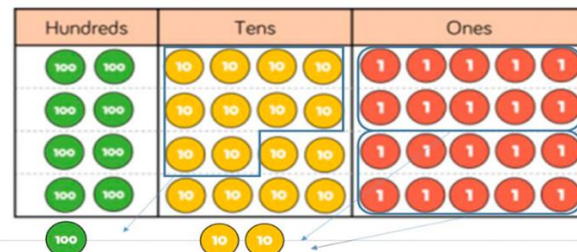
Year Group	Skill	Visual Representations	Formal Written Method	Key Vocabulary
1/2	Solve 1-Step Problems using Multiplication	 One bag holds 5 apples. How many apples do 4 bags hold? $5 + 5 + 5 + 5 = 20$ $4 \times 5 = 20$ $5 \times 4 = 20$		times multiply multiplied by groups of lots of repeated addition arrays
Multiplication represented as repeated addition in a variety of ways. In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record formally and are introduced to the multiplication symbol in Year 2.				
3/4	Multiply 2-Digit Numbers by 1-Digit Numbers	 $34 \times 5 = 170$	 $\begin{array}{r} \text{H} \quad \text{T} \quad \text{O} \\ 34 \\ \times 5 \\ \hline 170 \end{array}$ $\begin{array}{r} \text{H} \quad \text{T} \quad \text{O} \\ 34 \\ \times 5 \\ \hline 20 \quad (5 \times 4) \\ + 150 \quad (5 \times 30) \\ \hline 170 \end{array}$	times multiply multiplied by groups of lots of repeated addition arrays multiples product
Teachers may decide to first look at the expanded column method before moving onto the short multiplication method. The place value counters should be used to support the understanding of the method rather than supporting the multiplication as children should use times table knowledge.				

3/4

**Multiply
3-Digit
Numbers
by 1-Digit
Numbers**



$$245 \times 4 = 980$$



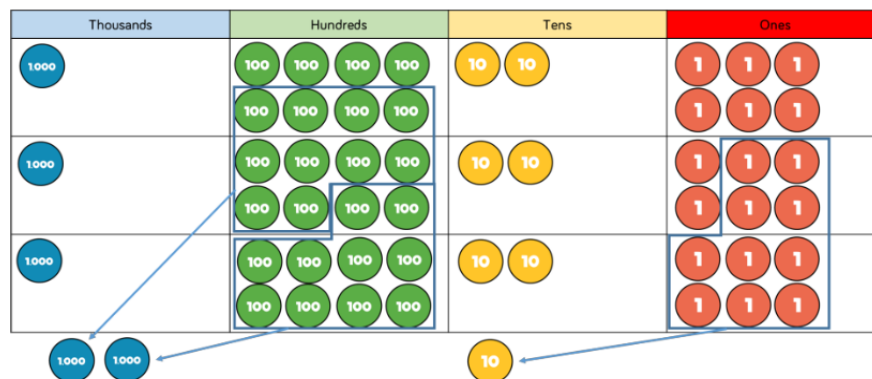
	H	T	O
	2	4	5
x			4
	9	8	0
	1	2	

times
multiply
multiplied by
groups of
lots of
repeated addition
arrays
multiples
product
factors
scaling

When moving to 3-digit by 1-digit multiplication, encourage children to move towards the short, formal method. Base 10 and place value counters continue to support the understanding of the written method. Limit the number of exchanged needed in the questions and move children away from resources when multiplying larger numbers.

5

**Multiply
4-Digit
Numbers
by 1-Digit
Numbers**



$$1,826 \times 3 = 5,478$$

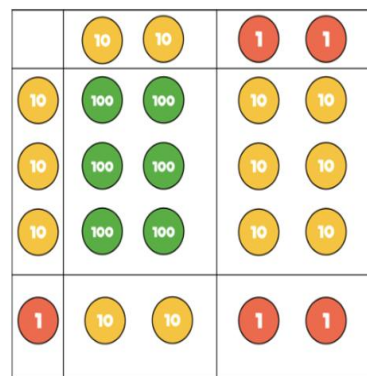
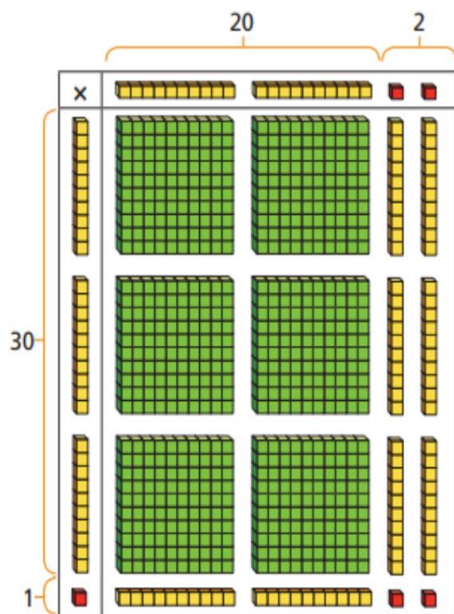
	Th	H	T	O
	1	8	2	6
x				3
	5	4	7	8
	2		1	

times
multiply
multiplied by
groups of
lots of
repeated addition
arrays
multiples
product
factors
scaling
square numbers
cube numbers
long multiplication

When multiplying 4-digit numbers, place value counters are the best manipulative to use to support children in their understanding of the formal written method. If children are multiplying larger numbers and struggling with their times tables, encourage the use of multiplication grids so children can focus on the use of the written method.

5

**Multiply
2-Digit
Numbers
by 2-Digit
Numbers**



x	20	2
30	600	60
1	20	2

$$22 \times 31 = 682$$

	H	T	O
		2	2
x		3	1
		2	2
+	6	6	0
	6	8	2

(1 x 22)

(30 x 22)

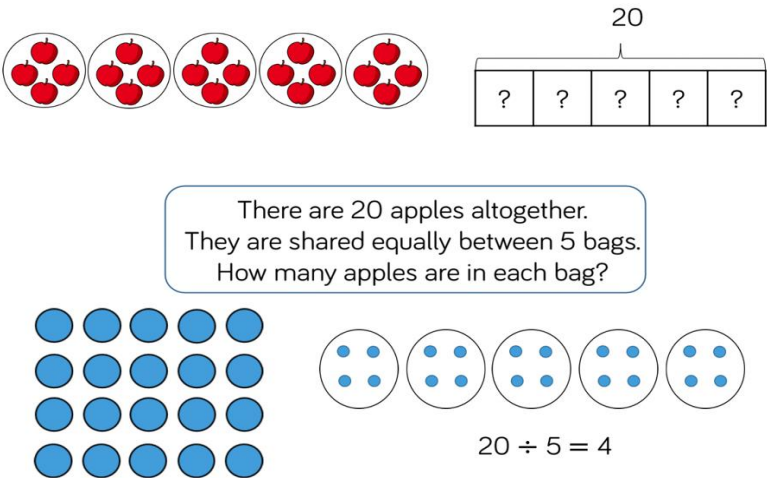
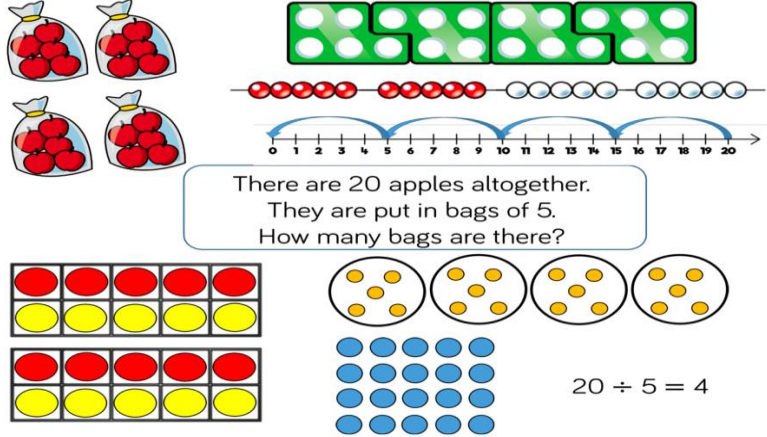
**times
multiply
multiplied by
groups of
lots of
repeated addition
arrays
multiples
product
factors
scaling
square numbers
cube numbers
long
multiplication**

When multiplying a multi-digit number by 2-digits, use the area model to help children understand the size of numbers they are using. This links to finding the area of a rectangle by finding the space covered by the Base 10. The grid method matches the area model as an initial written method before moving on to the formal written multiplication method.

5	Multiply 3-Digit Numbers by 2-Digit Numbers	100 100 10 10 10 1 1 1 1 10 1000 1000 1000 1000 1000 1000 100 100 100 100 100 100 100 100 100 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 1 1 100 100 10 10 10 1 1 1 1 1 1 100 100 10 10 10 1 1 1 1 × 200 30 4 30 6,000 900 120 2 400 60 8 234 × 32 = 7,488 <table><tr><td></td><td></td><td>2</td><td>3</td><td>4</td></tr><tr><td></td><td>x</td><td></td><td>3</td><td>2</td></tr><tr><td></td><td></td><td>4</td><td>6</td><td>8</td></tr><tr><td>+</td><td>7</td><td>0</td><td>2</td><td>0</td></tr><tr><td></td><td>1</td><td>1</td><td></td><td></td></tr><tr><td></td><td>7</td><td>4</td><td>8</td><td>8</td></tr></table> (2 x 234) (30 x 234)			2	3	4		x		3	2			4	6	8	+	7	0	2	0		1	1				7	4	8	8	times multiply multiplied by groups of lots of repeated addition arrays multiples product factors scaling square numbers cube numbers long multiplication																									
		2	3	4																																																						
	x		3	2																																																						
		4	6	8																																																						
+	7	0	2	0																																																						
	1	1																																																								
	7	4	8	8																																																						
Children can continue to use the area model when multiplying 3-digits by 2-digits. Place value counters become more efficient to use but Base 10 can be used to highlight the size of numbers. Encourage children to move towards the formal written method, seeing the links with the grid method.																																																										
6	Multiply 4-Digit Numbers by 2-Digit Numbers	2,739 × 28 = 76,692	<table><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td>2</td><td>7</td><td>3</td><td>9</td></tr><tr><td></td><td>x</td><td></td><td></td><td>2</td><td>8</td></tr><tr><td></td><td>2</td><td>1</td><td>9</td><td>1</td><td>2</td></tr><tr><td>+</td><td></td><td>5</td><td>3</td><td>7</td><td></td></tr><tr><td></td><td>5</td><td>4</td><td>7</td><td>8</td><td>0</td></tr><tr><td></td><td>1</td><td></td><td>1</td><td></td><td></td></tr><tr><td></td><td>7</td><td>6</td><td>6</td><td>9</td><td>2</td></tr><tr><td></td><td></td><td>1</td><td></td><td></td><td></td></tr></table> (8 x 2739) (20 x 2739)									2	7	3	9		x			2	8		2	1	9	1	2	+		5	3	7			5	4	7	8	0		1		1				7	6	6	9	2			1				times multiply multiplied by groups of lots of repeated addition arrays multiples product factors scaling square numbers cube numbers long multiplication
		2	7	3	9																																																					
	x			2	8																																																					
	2	1	9	1	2																																																					
+		5	3	7																																																						
	5	4	7	8	0																																																					
	1		1																																																							
	7	6	6	9	2																																																					
		1																																																								

When multiplying 4-digits by 2-digits, children should be confident in the written method. If they are still struggling with times tables, provide multiplication grids to support when they are focussing on the use of the method. Consider where exchanged digits are placed and make sure this is consistent.

Division

Year Group	Skill	Visual Representations	Formal Written Method	Key Vocabulary
1/2	Solve one-step problems with division (sharing)			divide divided by share share equally
	Children solve problems by sharing amounts into equal groups. In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record division formally. In Year 2, children are introduced to the division symbol.			
1/2	Solve one-step problems with division (grouping)		2 0 ÷ 5 = 4	divide divided by share share equally groups

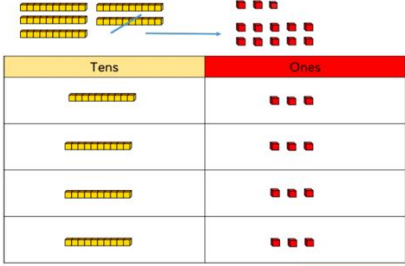
Children solve problems by grouping and counting the number of groups. Grouping encourages children to count in multiples and links to repeated subtraction on a number line. They can use concrete representations in fixed groups such as number shapes which help to show the link between multiplication and division.

3	Divide 2-digits by 1-digit (no exchange sharing)	<table><tr><th>Tens</th><th>Ones</th></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table> 48 40 8 ÷ 2 ÷ 2 48 ÷ 2 = 24	Tens	Ones					48 ÷ 2 = 24	divide divided by divided into share share equally groups														
Tens	Ones																							
When dividing larger numbers, children can use manipulatives that allow them to partition into tens and ones. Straws, Base 10 and place value counters can all be used to share numbers into equal groups. Part – whole models can provide children with a clear written method that mathest the concrete representations.																								
3	Divide 2-digits by 1-digit (sharing with exchange)	<table><tr><th>Tens</th><th>Ones</th></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table> 52 ? ? ? ? 52 ÷ 4 = 13 40 12 ÷ 4 ÷ 4 10 3 10 + 3 = 13 <table><tr><th>Tens</th><th>Ones</th></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>	Tens	Ones									Tens	Ones									52 ÷ 4 = 13	divide divided by divided into share share equally groups exchange
Tens	Ones																							
Tens	Ones																							

When dividing numbers involving an exchange, children can use Base 10 and place value counters to exchange one ten for ten ones. Children should start with the equipment outside the place value grid before sharing the tens and ones equally between the rows. Flexible partitioning in a part-whole model supports this method.

3/4

Divide 2-digit by 1-digit
(sharing with remainders)



53

13

13

13

13

1

53

40

13

12

1

÷ 4

10

÷ 4

3

53 ÷ 4 = 13 r1



53 ÷ 4 = 13 r 1

divide

divided by

divided into

share

share equally

groups

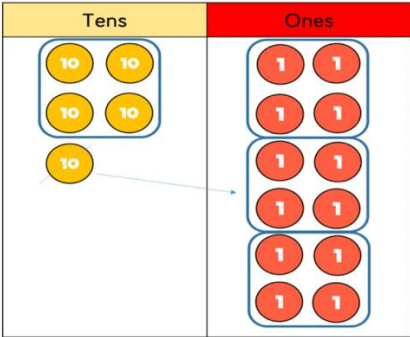
exchange

remainder

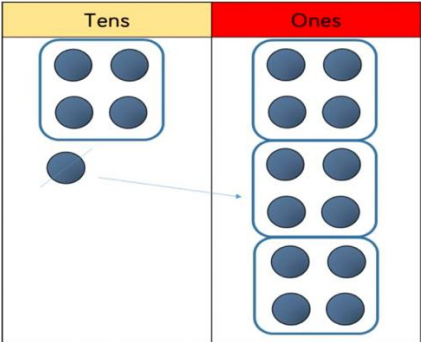
When dividing numbers with remainders, children can use Base 10 and place value counters to exchange one ten for ten ones. Starting with the equipment outside the place value grid will highlight remainders, as they will be left outside the grid once the equal groups have been made. Flexible partitioning in a part-whole model supports this method.

4/5

Divide 2-digits by 1-digit
(grouping)



52 ÷ 4 = 13



divide

divided by

divided into

share

share equally

groups

remainder

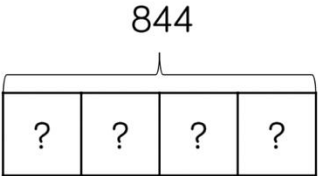
inverse

When using the short division method, children use grouping. Starting with the largest place value, they group by the divisor. Language is important here. Children should consider “How many groups of 4 tens can we make?” and “How many groups of 4 ones can we make?” Remainders can also be seen as they are left ungrouped.

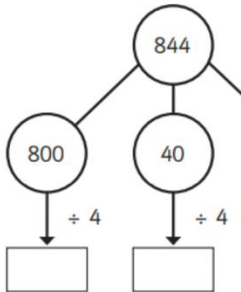
4

Divide 3-
digits by 1-
digit
(sharing
with
exchange)

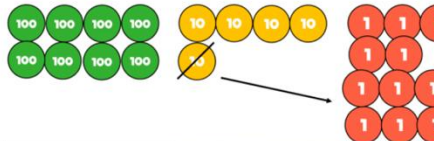
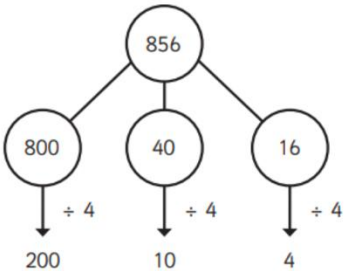
844 ÷ 4 = 211



H	T	O
100 100	10	1
100 100	10	1
100 100	10	1
100 100	10	1



844 ÷ 4 = 211



Hundreds	Tens	Ones
100 100	10	1 1
100 100	10	1 1
100 100	10	1 1
100 100	10	1 1

8 4 4 ÷ 4 = 2 1 1

divide
divided by
divided into
share
share equally
groups
remainder
inverse

Children can continue to use place value counters to share 3-digit numbers into equal groups. Children should start with the equipment outside the place value grid before sharing the hundreds, tens and ones equally between the rows. This method can also help to highlight remainders. Flexible partitioning in a part-whole model supports this method.

4/5

Divide 3-digits by 1-digit (grouping)

Hundreds

Tens

Ones

100 100 100 100

100 100 100 100

10 10 10 10

10

1 1 1 1

1 1

1 1

1 1

1 1

2 1

4 8 5

Hundreds

Tens

One

● ● ● ●

● ● ● ●

● ● ● ● ●

● ● ● ●

● ●

● ●

● ●

856 ÷ 4 = 214

2 1 4

4 8 5 16

“Bus Stop” method of short division

divide

divided by

divided into

share

share equally

groups

remainder

inverse

Children can continue to use grouping to support their understanding of short division when dividing 3-digit numbers by a 1-digit number. Place value counters or plain counters can be used on a place value grid to support the understanding. Children can also draw their own counters and group them through a more pictorial method.

5	Divide 4-digit by 1-digit (grouping)	<table><tr><th>Th</th><th>H</th><th>T</th><th>O</th></tr><tr><td> 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 </td><td> 100 100 100 100 100 </td><td> 10 10 10 10 10 10 10 10 10 10 10 10 10 </td><td> 1 1 1 1 1 1 1 1 1 1 1 1 1 1 </td></tr></table> 8 5 3 2 ÷ 2 = 4 2 6 6 8532 ÷ 2 = 4266	Th	H	T	O	1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000	100 100 100 100 100	10 10 10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1 1 1 1	divide divided by divided into share share equally groups remainder inverse divisor quotient long division																					
		Th	H	T	O																											
1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000	100 100 100 100 100	10 10 10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1 1 1 1																													
Place value counters or plain counters can be used on a place value grid to support children to divide 4-digits by 1-digit. Children can also draw their own counters and group them through a more pictorial method. Children should be encouraged to move away from the concrete and pictorial when dividing numbers with multiple exchanges.																																
6	Divide multi-digits by 2-digits (short division)	432 ÷ 12 7335 ÷ 15 <table><tr><td>15</td><td>30</td><td>45</td><td>60</td><td>75</td><td>90</td><td>105</td><td>120</td><td>135</td><td>150</td></tr></table>	15	30	45	60	75	90	105	120	135	150	<table><tr><td></td><td>0</td><td>3</td><td>6</td></tr><tr><td>12</td><td>4</td><td> 4 3 </td><td> 7 2 </td></tr></table> <table><tr><td></td><td>0</td><td>4</td><td>8</td><td>9</td></tr><tr><td>15</td><td>7</td><td> 7 3 </td><td> 13 3 </td><td> 13 5 </td></tr></table> “Bus Stop” method of short division		0	3	6	12	4	4 3	7 2		0	4	8	9	15	7	7 3	13 3	13 5	divide divided by divided into share share equally groups remainder inverse divisor quotient long division fraction decimal
		15	30	45	60	75	90	105	120	135	150																					
	0	3	6																													
12	4	4 3	7 2																													
	0	4	8	9																												
15	7	7 3	13 3	13 5																												

When children begin to divide up to 4-digits by 2-digits, written methods become the most accurate as concrete and pictorial representations become less effective. Children can write out multiplies to support their calculations with larger remainders. Children will also solve problems with remainders where the quotient can be rounded as appropriate.

6

Divide multi-digits by 2-digits (long division)

$$432 \div 12 = 36$$

$$7335 \div 15 = 489$$

			0	3	6			
1	2	~~3~~ 4	1	3	2		1	2
	-	3	6				2	4
		0	7	2			3	6
		-	7	2			4	8
			0	0			6	0
							7	2
							8	4
							9	6
						1	0	8
						1	2	0

			0	4	8	9		
1	5	7	3	3	5		1	5
	-	6	0				3	0
		1	3	3			4	5
	-	1	2	0			6	0
		0	1	3	5		7	5
			1	3	5		9	0
			0	0	0		1	0
							1	2
							1	3
							1	5

divide
divided by
divided into
share
share equally
groups
remainder
inverse
divisor
quotient
long division
fraction
decimal

	Children can also divide by 2-digit numbers using long division. Children can write out multiples to support their calculations with larger remainders. Children will also solve problems with remainders where the quotient can be rounded as appropriate.																																																																																																																																																																																																																																														
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General Vocabulary		
Number	1	digit, numeral, zero, more, less, count, forward, backward, number line, odd, even, pair, whole
	2	digit, numeral, place value, partition, tens, ones, odd, even, sequence, number bonds, greater than, less than, equal to
	3	digit, numeral, partition, place value, estimate, round, multiple, factor, divisible, sequence, compare, order, greater than, less than
	4	place value, round, nearest, decimal, fraction, equivalent fraction, improper fraction, mixed number, numerator, denominator, factor, multiple, prime number, square number
	5	place value, round, powers of ten, negative number, decimal, fraction, equivalent fraction, improper fraction, mixed number, numerator, denominator, percentage, ratio, proportion, prime number, composite number, cube number, square root
	6	place value, integers, round, negative number, decimal, fraction, simplify, equivalent fractions, improper fraction, mixed number, numerator, denominator, ratio, proportion, percentage, prime number, composite number, factors, multiples, powers, cube root, square root
Geometry	1	shape, 2D, 3D, sides, corners, edges, faces, straight, curved, flat, solid, circle, triangle, square, rectangle, cube, cuboid, sphere, cone
	2	line of symmetry, 2D, 3D, circle, triangle, square, rectangle, pentagon, hexagon, octagon, cube, cuboid, sphere, cone, pyramid, cylinder, pattern, position, direction, clockwise, anti-clockwise, quarter turn, half turn
	3	angle, right angle, acute, obtuse, horizontal, vertical, parallel, perpendicular, polygon, quadrilateral, rhombus, parallelogram, trapezium, prism, orientation, compass directions (north, south, east, west)
	4	symmetry, line of symmetry, reflection, translation, coordinates, grid, point, vertex, vertices, edges, faces, nets, angles, degrees, acute, obtuse, perpendicular, parallel, polygon
	5	angle, degrees, protractor, measure, draw, acute, obtuse, reflex, polygon, regular, irregular, translation, reflection, coordinates, axes, quadrant, 3D shapes, properties, vertices, edges, faces
	6	circle, radius, diameter, circumference, angles, degrees, protractor, acute, obtuse, reflex, polygon, regular, irregular, translation, reflection, coordinates, axes, quadrants, 3D shapes, nets, properties, scale factor

Measurement	1	length, height, weight, mass, heavy, light, longer, shorter, taller, more, less, full, empty, half full, time, hour, minute, second, clock, morning, afternoon, days of the week, months, seasons, money, penny, pence, pound
	2	length, height, width, depth, centimetres, metres, kilograms, grams, litres, millilitres, temperature, degrees, time, hour, minute, second, quarter past, quarter to, coins, notes, total, change
	3	length, perimeter, area, centimetres, metres, millimetres, kilometres, kilograms, grams, litres, millilitres, temperature, degrees, analogue, digital, a.m., p.m., 12-hour, 24-hour
	4	length, width, perimeter, area, volume, centimetres, millimetres, metres, kilometres, kilograms, grams, litres, millilitres, time, hour, minute, second, analogue, digital, conversion
	5	perimeter, area, volume, capacity, metric units, imperial units, conversion, length, mass, weight, time, hours, minutes, seconds, money, budgeting, intervals
	6	length, perimeter, area, volume, capacity, metric units, imperial units, conversion, scale, time, duration, intervals, speed, money, budgeting, precision

White Rose Calculation Policy:

<https://assets.whiteroseeducation.com/new-schemes/WRM%20calculation%20policy%202024%20All%20year%20groups.pdf>

White Rose Vocabulary Policy:

<https://assets.whiteroseeducation.com/new-schemes/Primary%20maths%20-%20Vocabulary%20progression.pdf>

Ready to Progress DfE Document:

https://assets.publishing.service.gov.uk/media/6140b7008fa8f503ba3dc8d1/Maths_guidance_KS_1_and_2.pdf

White Rose – Ready to Progress:

<https://assets.whiteroseeducation.com/new-schemes/NEW%20NC%20RTP%202024.pdf>

NCETM Ready to Progress Exemplification (Interventions Tool)

<https://www.ncetm.org.uk/classroom-resources/exemplification-of-ready-to-progress-criteria/>

National Curriculum Objectives:

Key stage 1 - years 1 and 2

The principal focus of mathematics teaching in key stage 1 is to ensure that pupils develop confidence and mental fluency with whole numbers, counting and place value. This should involve working with numerals, words and the 4 operations, including with practical resources [for example, concrete objects and measuring tools].

At this stage, pupils should develop their ability to recognise, describe, draw, compare and sort different shapes and use the related vocabulary. Teaching should also involve using a range of measures to describe and compare different quantities such as length, mass, capacity/volume, time and money.

By the end of year 2, pupils should know the number bonds to 20 and be precise in using and understanding place value. An emphasis on practice at this early stage will aid fluency.

Pupils should read and spell mathematical vocabulary, at a level consistent with their increasing word reading and spelling knowledge at key stage 1.

Year 1 programme of study

Number - number and place value

Pupils should be taught to:

- count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number
- count, read and write numbers to 100 in numerals; count in multiples of 2s, 5s and 10s
- given a number, identify 1 more and 1 less
- identify and represent numbers using objects and pictorial representations including the number line, and use the language of: equal to, more than, less than (fewer), most, least
- read and write numbers from 1 to 20 in numerals and words

Notes and guidance (non-statutory)

Pupils practise counting (1, 2, 3...), ordering (for example, first, second, third...), and to indicate a quantity (for example, 3 apples, 2 centimetres), including solving simple concrete problems, until they are fluent.

Pupils begin to recognise place value in numbers beyond 20 by reading, writing, counting and comparing numbers up to 100, supported by objects and pictorial representations.

They practise counting as reciting numbers and counting as enumerating objects, and counting in 2s, 5s and 10s from different multiples to develop their recognition of patterns in the number system (for example, odd and even numbers), including varied and frequent practice through increasingly complex questions.

They recognise and create repeating patterns with objects and with shapes.

Number - addition and subtraction

Pupils should be taught to:

- read, write and interpret mathematical statements involving addition (+), subtraction (−) and equals (=) signs
- represent and use number bonds and related subtraction facts within 20
- add and subtract one-digit and two-digit numbers to 20, including 0
- solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as $7 = ? - 9$

Notes and guidance (non-statutory)

Pupils memorise and reason with number bonds to 10 and 20 in several forms (for example, $9 + 7 = 16$; $16 - 7 = 9$; $7 = 16 - 9$). They should realise the effect of adding or subtracting 0. This establishes addition and subtraction as related operations.

Pupils combine and increase numbers, counting forwards and backwards.

They discuss and solve problems in familiar practical contexts, including using quantities. Problems should include the terms: put together, add, altogether, total, take away, distance between, difference between, more than and less than, so that pupils develop the concept of addition and subtraction and are enabled to use these operations flexibly.

Number - multiplication and division

Pupils should be taught to:

- solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher

Notes and guidance (non-statutory)

Through grouping and sharing small quantities, pupils begin to understand:

- multiplication and division
- doubling numbers and quantities

- finding simple fractions of objects, numbers and quantities

They make connections between arrays, number patterns, and counting in 2s, 5s and 10s.

Number - fractions

Pupils should be taught to:

- recognise, find and name a half as 1 of 2 equal parts of an object, shape or quantity
- recognise, find and name a quarter as 1 of 4 equal parts of an object, shape or quantity

Notes and guidance (non-statutory)

Pupils are taught half and quarter as ‘fractions of’ discrete and continuous quantities by solving problems using shapes, objects and quantities. For example, they could recognise and find half a length, quantity, set of objects or shape. Pupils connect halves and quarters to the equal sharing and grouping of sets of objects and to measures, as well as recognising and combining halves and quarters as parts of a whole.

Measurement

Pupils should be taught to:

- compare, describe and solve practical problems for:
 - lengths and heights [for example, long/short, longer/shorter, tall/short, double/half]
 - mass/weight [for example, heavy/light, heavier than, lighter than]
 - capacity and volume [for example, full/empty, more than, less than, half, half full, quarter]
 - time [for example, quicker, slower, earlier, later]
- measure and begin to record the following:
 - lengths and heights
 - mass/weight
 - capacity and volume
 - time (hours, minutes, seconds)
 - recognise and know the value of different denominations of coins and notes
 - sequence events in chronological order using language [for example, before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening]
- recognise and use language relating to dates, including days of the week, weeks, months and years

- tell the time to the hour and half past the hour and draw the hands on a clock face to show these times

Notes and guidance (non-statutory)

The pairs of terms: mass and weight, volume and capacity, are used interchangeably at this stage.

Pupils move from using and comparing different types of quantities and measures using non-standard units, including discrete (for example, counting) and continuous (for example, liquid) measurement, to using manageable common standard units.

In order to become familiar with standard measures, pupils begin to use measuring tools such as a ruler, weighing scales and containers.

Pupils use the language of time, including telling the time throughout the day, first using o'clock and then half past.

Geometry - properties of shapes

Pupils should be taught to:

- recognise and name common 2-D and 3-D shapes, including:
 - 2-D shapes [for example, rectangles (including squares), circles and triangles]
 - 3-D shapes [for example, cuboids (including cubes), pyramids and spheres]

Notes and guidance (non-statutory)

Pupils handle common 2-D and 3-D shapes, naming these and related everyday objects fluently. They recognise these shapes in different orientations and sizes, and know that rectangles, triangles, cuboids and pyramids are not always similar to each other.

Geometry - position and direction

Pupils should be taught to:

- describe position, direction and movement, including whole, half, quarter and three-quarter turns

Notes and guidance (non-statutory)

Pupils use the language of position, direction and motion, including: left and right, top, middle and bottom, on top of, in front of, above, between, around, near, close and far, up and down, forwards and backwards, inside and outside.

Pupils make whole, half, quarter and three-quarter turns in both directions and connect turning clockwise with movement on a clock face.

Year 2 programme of study

Number - number and place value

Pupils should be taught to:

- count in steps of 2, 3, and 5 from 0, and in 10s from any number, forward and backward
- recognise the place value of each digit in a two-digit number (10s, 1s)
- identify, represent and estimate numbers using different representations, including the number line
- compare and order numbers from 0 up to 100; use $<$, $>$ and $=$ signs
- read and write numbers to at least 100 in numerals and in words
- use place value and number facts to solve problems

Notes and guidance (non-statutory)

Using materials and a range of representations, pupils practise counting, reading, writing and comparing numbers to at least 100 and solving a variety of related problems to develop fluency. They count in multiples of 3 to support their later understanding of a third.

As they become more confident with numbers up to 100, pupils are introduced to larger numbers to develop further their recognition of patterns within the number system and represent them in different ways, including spatial representations.

Pupils should partition numbers in different ways (for example, $23 = 20 + 3$ and $23 = 10 + 13$) to support subtraction. They become fluent and apply their knowledge of numbers to reason with, discuss and solve problems that emphasise the value of each digit in two-digit numbers. They begin to understand 0 as a place holder.

Number - addition and subtraction

Pupils should be taught to:

- solve problems with addition and subtraction:
 - using concrete objects and pictorial representations, including those involving numbers, quantities and measures
 - applying their increasing knowledge of mental and written methods
- recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100
- add and subtract numbers using concrete objects, pictorial representations, and mentally, including:
 - a two-digit number and 1s
 - a two-digit number and 10s
 - 2 two-digit numbers

- adding 3 one-digit numbers
- show that addition of 2 numbers can be done in any order (commutative) and subtraction of 1 number from another cannot
- recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems

Notes and guidance (non-statutory)

Pupils extend their understanding of the language of addition and subtraction to include sum and difference.

Pupils practise addition and subtraction to 20 to become increasingly fluent in deriving facts such as using $3 + 7 = 10$; $10 - 7 = 3$ and $7 = 10 - 3$ to calculate $30 + 70 = 100$; $100 - 70 = 30$ and $70 = 100 - 30$. They check their calculations, including by adding to check subtraction and adding numbers in a different order to check addition (for example, $5 + 2 + 1 = 1 + 5 + 2 = 1 + 2 + 5$). This establishes commutativity and associativity of addition.

Recording addition and subtraction in columns supports place value and prepares for formal written methods with larger numbers.

Number - multiplication and division

Pupils should be taught to:

- recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers
- calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication ($\times$), division ($\div$) and equals ($=$) signs
- show that multiplication of 2 numbers can be done in any order (commutative) and division of 1 number by another cannot
- solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts

Notes and guidance (non-statutory)

Pupils use a variety of language to describe multiplication and division.

Pupils are introduced to the multiplication tables. They practise to become fluent in the 2, 5 and 10 multiplication tables and connect them to each other. They connect the 10 multiplication table to place value, and the 5 multiplication table to the divisions on the clock face. They begin to use other multiplication tables and recall multiplication facts, including using related division facts to perform written and mental calculations.

Pupils work with a range of materials and contexts in which multiplication and division relate to grouping and sharing discrete and continuous quantities, to arrays and to repeated addition. They begin to relate these to fractions and measures (for example, $40 \div 2 = 20$,

20 is a half of 40). They use commutativity and inverse relations to develop multiplicative reasoning (for example, $4 \times 5 = 20$ and $20 \div 5 = 4$).

Number - fractions

Pupils should be taught to:

- recognise, find, name and write fractions $\frac{1}{3}$, $\frac{1}{4}$, $\frac{2}{4}$ and $\frac{3}{4}$ of a length, shape, set of objects or quantity
- write simple fractions, for example $\frac{1}{2}$ of 6 = 3 and recognise the equivalence of $\frac{2}{4}$ and $\frac{1}{2}$

Notes and guidance (non-statutory)

Pupils use fractions as ‘fractions of’ discrete and continuous quantities by solving problems using shapes, objects and quantities. They connect unit fractions to equal sharing and grouping, to numbers when they can be calculated, and to measures, finding fractions of lengths, quantities, sets of objects or shapes. They meet $\frac{3}{4}$ as the first example of a non-unit fraction.

Pupils should count in fractions up to 10, starting from any number and using the $\frac{1}{2}$ and $\frac{2}{4}$ equivalence on the number line (for example, $1\frac{1}{4}$, $1\frac{2}{4}$ (or $1\frac{1}{2}$), $1\frac{3}{4}$, 2). This reinforces the concept of fractions as numbers and that they can add up to more than 1.

Measurement

Pupils should be taught to:

- choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature ($^{\circ}\text{C}$); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels
- compare and order lengths, mass, volume/capacity and record the results using $>$, $<$ and $=$
- recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value
- find different combinations of coins that equal the same amounts of money
- solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change
- compare and sequence intervals of time
- tell and write the time to five minutes, including quarter past/to the hour and draw the hands on a clock face to show these times
- know the number of minutes in an hour and the number of hours in a day

Notes and guidance (non-statutory)

Pupils use standard units of measurement with increasing accuracy, using their knowledge of the number system. They use the appropriate language and record using standard abbreviations.

Comparing measures includes simple multiples such as 'half as high'; 'twice as wide'.

Pupils become fluent in telling the time on analogue clocks and recording it.

They become fluent in counting and recognising coins. They read and say amounts of money confidently and use the symbols £ and p accurately, recording pounds and pence separately.

Geometry - properties of shapes

Pupils should be taught to:

- identify and describe the properties of 2-D shapes, including the number of sides, and line symmetry in a vertical line
- identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces
- identify 2-D shapes on the surface of 3-D shapes, [for example, a circle on a cylinder and a triangle on a pyramid]
- compare and sort common 2-D and 3-D shapes and everyday objects

Notes and guidance (non-statutory)

Pupils handle and name a wide variety of common 2-D and 3-D shapes including: quadrilaterals and polygons and cuboids, prisms and cones, and identify the properties of each shape (for example, number of sides, number of faces). Pupils identify, compare and sort shapes on the basis of their properties and use vocabulary precisely, such as sides, edges, vertices and faces.

Pupils read and write names for shapes that are appropriate for their word reading and spelling. Pupils draw lines and shapes using a straight edge.

Geometry - position and direction

Pupils should be taught to:

- order and arrange combinations of mathematical objects in patterns and sequences
- use mathematical vocabulary to describe position, direction and movement, including movement in a straight line and distinguishing between rotation as a turn and in terms of right angles for quarter, half and three-quarter turns (clockwise and anti-clockwise)

Notes and guidance (non-statutory)

Pupils should work with patterns of shapes, including those in different orientations.

Pupils use the concept and language of angles to describe 'turn' by applying rotations, including in practical contexts (for example, pupils themselves moving in turns, giving instructions to other pupils to do so, and programming robots using instructions given in right angles).

Statistics

Pupils should be taught to:

- interpret and construct simple pictograms, tally charts, block diagrams and tables
- ask and answer simple questions by counting the number of objects in each category and sorting the categories by quantity
- ask-and-answer questions about totalling and comparing categorical data

Notes and guidance (non-statutory)

Pupils record, interpret, collate, organise and compare information (for example, using many-to-one correspondence in pictograms with simple ratios 2, 5, 10).

Lower key stage 2 - years 3 and 4

The principal focus of mathematics teaching in lower key stage 2 is to ensure that pupils become increasingly fluent with whole numbers and the 4 operations, including number facts and the concept of place value. This should ensure that pupils develop efficient written and mental methods and perform calculations accurately with increasingly large whole numbers.

At this stage, pupils should develop their ability to solve a range of problems, including with simple fractions and decimal place value.

Teaching should also ensure that pupils draw with increasing accuracy and develop mathematical reasoning so they can analyse shapes and their properties, and confidently describe the relationships between them. It should ensure that they can use measuring instruments with accuracy and make connections between measure and number.

By the end of year 4, pupils should have memorised their multiplication tables up to and including the 12 multiplication table and show precision and fluency in their work.

Pupils should read and spell mathematical vocabulary correctly and confidently, using their growing word-reading knowledge and their knowledge of spelling.

Year 3 programme of study

Number - number and place value

Pupils should be taught to:

- count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number
- recognise the place value of each digit in a 3-digit number (100s, 10s, 1s)
- compare and order numbers up to 1,000
- identify, represent and estimate numbers using different representations
- read and write numbers up to 1,000 in numerals and in words
- solve number problems and practical problems involving these ideas

Notes and guidance (non-statutory)

Pupils now use multiples of 2, 3, 4, 5, 8, 10, 50 and 100.

They use larger numbers to at least 1,000, applying partitioning related to place value using varied and increasingly complex problems, building on work in year 2 (for example, $146 = 100 + 40 + 6$, $146 = 130 + 16$).

Using a variety of representations, including those related to measure, pupils continue to count in 1s, 10s and 100s, so that they become fluent in the order and place value of numbers to 1,000.

Number - addition and subtraction

Pupils should be taught to:

- add and subtract numbers mentally, including:
 - a three-digit number and 1s
 - a three-digit number and 10s
 - a three-digit number and 100s
- add and subtract numbers with up to 3 digits, using formal written methods of columnar addition and subtraction
- estimate the answer to a calculation and use inverse operations to check answers
- solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction

Notes and guidance (non-statutory)

Pupils practise solving varied addition and subtraction questions. For mental calculations with two-digit numbers, the answers could exceed 100.

Pupils use their understanding of place value and partitioning, and practise using columnar addition and subtraction with increasingly large numbers up to 3 digits to become fluent (see [mathematics appendix 1 \(PDF, 248KB\)](#)).

Number - multiplication and division

Pupils should be taught to:

- recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods
- solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects

Notes and guidance (non-statutory)

Pupils continue to practise their mental recall of multiplication tables when they are calculating mathematical statements in order to improve fluency. Through doubling, they connect the 2, 4 and 8 multiplication tables.

Pupils develop efficient mental methods, for example, using commutativity and associativity (for example, $4 \times 12 \times 5 = 4 \times 5 \times 12 = 20 \times 12 = 240$) and multiplication and division facts (for example, using $3 \times 2 = 6$, $6 \div 3 = 2$ and $2 = 6 \div 3$) to derive related facts ($30 \times 2 = 60$, $60 \div 3 = 20$ and $20 = 60 \div 3$).

Pupils develop reliable written methods for multiplication and division, starting with calculations of two-digit numbers by one-digit numbers and progressing to the formal written methods of short multiplication and division.

Pupils solve simple problems in contexts, deciding which of the 4 operations to use and why. These include measuring and scaling contexts, (for example 4 times as high, 8 times as long etc) and correspondence problems in which m objects are connected to n objects (for example, 3 hats and 4 coats, how many different outfits?, 12 sweets shared equally between 4 children, 4 cakes shared equally between 8 children).

Number - fractions

Pupils should be taught to:

- count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10
- recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators
- recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators
- recognise and show, using diagrams, equivalent fractions with small denominators
- add and subtract fractions with the same denominator within one whole [for example, $\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$]
- compare and order unit fractions, and fractions with the same denominators
- solve problems that involve all of the above

Notes and guidance (non-statutory)

Pupils connect tenths to place value, decimal measures and to division by 10.

They begin to understand unit and non-unit fractions as numbers on the number line, and deduce relations between them, such as size and equivalence. They should go beyond the $[0, 1]$ interval, including relating this to measure.

Pupils understand the relation between unit fractions as operators (fractions of), and division by integers.

They continue to recognise fractions in the context of parts of a whole, numbers, measurements, a shape, and unit fractions as a division of a quantity.

Pupils practise adding and subtracting fractions with the same denominator through a variety of increasingly complex problems to improve fluency.

Measurement

Pupils should be taught to:

- measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml)
- measure the perimeter of simple 2-D shapes
- add and subtract amounts of money to give change, using both £ and p in practical contexts
- tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks
- estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes and hours; use vocabulary such as o'clock, am/pm, morning, afternoon, noon and midnight
- know the number of seconds in a minute and the number of days in each month, year and leap year

- compare durations of events [for example, to calculate the time taken by particular events or tasks]

Notes and guidance (non-statutory)

Pupils continue to measure using the appropriate tools and units, progressing to using a wider range of measures, including comparing and using mixed units (for example, 1 kg and 200g) and simple equivalents of mixed units (for example, 5m = 500cm).

The comparison of measures includes simple scaling by integers (for example, a given quantity or measure is twice as long or 5 times as high) and this connects to multiplication.

Pupils continue to become fluent in recognising the value of coins, by adding and subtracting amounts, including mixed units, and giving change using manageable amounts. They record £ and p separately. The decimal recording of money is introduced formally in year 4.

Pupils use both analogue and digital 12-hour clocks and record their times. In this way they become fluent in and prepared for using digital 24-hour clocks in year 4.

Geometry - properties of shapes

Pupils should be taught to:

- draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them
- recognise angles as a property of shape or a description of a turn
- identify right angles, recognise that 2 right angles make a half-turn, 3 make three-quarters of a turn and 4 a complete turn; identify whether angles are greater than or less than a right angle
- identify horizontal and vertical lines and pairs of perpendicular and parallel lines

Notes and guidance (non-statutory)

Pupils' knowledge of the properties of shapes is extended at this stage to symmetrical and non-symmetrical polygons and polyhedra.

Pupils extend their use of the properties of shapes. They should be able to describe the properties of 2-D and 3-D shapes using accurate language, including lengths of lines and acute and obtuse for angles greater or lesser than a right angle.

Pupils connect decimals and rounding to drawing and measuring straight lines in centimetres, in a variety of contexts.

Statistics

Pupils should be taught to:

- interpret and present data using bar charts, pictograms and tables
- solve one-step and two-step questions [for example ‘How many more?’ and ‘How many fewer?’] using information presented in scaled bar charts and pictograms and tables

Notes and guidance (non-statutory)

Pupils understand and use simple scales (for example, 2, 5, 10 units per cm) in pictograms and bar charts with increasing accuracy. They continue to interpret data presented in many contexts.

Year 4 programme of study

Number - number and place value

Pupils should be taught to:

- count in multiples of 6, 7, 9, 25 and 1,000
- find 1,000 more or less than a given number
- count backwards through 0 to include negative numbers
- recognise the place value of each digit in a four-digit number (1,000s, 100s, 10s, and 1s)
- order and compare numbers beyond 1,000
- identify, represent and estimate numbers using different representations
- round any number to the nearest 10, 100 or 1,000
- solve number and practical problems that involve all of the above and with increasingly large positive numbers
- read Roman numerals to 100 (I to C) and know that over time, the numeral system changed to include the concept of 0 and place value

Notes and guidance (non-statutory)

Using a variety of representations, including measures, pupils become fluent in the order and place value of numbers beyond 1,000, including counting in 10s and 100s, and maintaining fluency in other multiples through varied and frequent practice.

They begin to extend their knowledge of the number system to include the decimal numbers and fractions that they have met so far.

They connect estimation and rounding numbers to the use of measuring instruments.

Roman numerals should be put in their historical context so pupils understand that there have been different ways to write whole numbers and that the important concepts of 0 and place value were introduced over a period of time.

Number - addition and subtraction

Pupils should be taught to:

- add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate
- estimate and use inverse operations to check answers to a calculation
- solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why

Notes and guidance (non-statutory)

Pupils continue to practise both mental methods and columnar addition and subtraction with increasingly large numbers to aid fluency (see [mathematics appendix 1 \(PDF, 248KB\)](#)).

Number - multiplication and division

Pupils should be taught to:

- recall multiplication and division facts for multiplication tables up to 12×12
- use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together 3 numbers
- recognise and use factor pairs and commutativity in mental calculations
- multiply two-digit and three-digit numbers by a one-digit number using formal written layout
- solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by 1 digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects

Notes and guidance (non-statutory)

Pupils continue to practise recalling and using multiplication tables and related division facts to aid fluency.

Pupils practise mental methods and extend this to 3-digit numbers to derive facts, (for example $600 \div 3 = 200$ can be derived from $2 \times 3 = 6$).

Pupils practise to become fluent in the formal written method of short multiplication and short division with exact answers (see [mathematics appendix 1 \(PDF, 248KB\)](#)).

Pupils write statements about the equality of expressions (for example, use the distributive law $39 \times 7 = 30 \times 7 + 9 \times 7$ and associative law $(2 \times 3) \times 4 = 2 \times (3 \times 4)$). They combine their knowledge of number facts and rules of arithmetic to solve mental and written calculations for example, $2 \times 6 \times 5 = 10 \times 6 = 60$.

Pupils solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as the numbers of choices of a meal on a menu, or 3 cakes shared equally between 10 children.

Number - fractions (including decimals)

Pupils should be taught to:

- recognise and show, using diagrams, families of common equivalent fractions
- count up and down in hundredths; recognise that hundredths arise when dividing an object by 100 and dividing tenths by 10
- solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number
- add and subtract fractions with the same denominator
- recognise and write decimal equivalents of any number of tenths or hundreds
- recognise and write decimal equivalents to $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$
- find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths
- round decimals with 1 decimal place to the nearest whole number
- compare numbers with the same number of decimal places up to 2 decimal places
- solve simple measure and money problems involving fractions and decimals to 2 decimal places

Notes and guidance (non-statutory)

Pupils should connect hundredths to tenths and place value and decimal measure.

They extend the use of the number line to connect fractions, numbers and measures.

Pupils understand the relation between non-unit fractions and multiplication and division of quantities, with particular emphasis on tenths and hundredths.

Pupils make connections between fractions of a length, of a shape and as a representation of one whole or set of quantities. Pupils use

factors and multiples to recognise equivalent fractions and simplify where appropriate (for example, $\frac{6}{9} = \frac{2}{3}$ or $\frac{1}{4} = \frac{2}{8}$).

Pupils continue to practise adding and subtracting fractions with the same denominator, to become fluent through a variety of increasingly complex problems beyond one whole.

Pupils are taught throughout that decimals and fractions are different ways of expressing numbers and proportions.

Pupils' understanding of the number system and decimal place value is extended at this stage to tenths and then hundredths. This includes relating the decimal notation to division of whole number by 10 and later 100.

They practise counting using simple fractions and decimals, both forwards and backwards.

Pupils learn decimal notation and the language associated with it, including in the context of measurements. They make comparisons and order decimal amounts and quantities that are expressed to the same number of decimal places. They should be able to represent numbers with 1 or 2 decimal places in several ways, such as on number lines.

Measurement

Pupils should be taught to:

- convert between different units of measure [for example, kilometre to metre; hour to minute]
- measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres
- find the area of rectilinear shapes by counting squares
- estimate, compare and calculate different measures, including money in pounds and pence
- read, write and convert time between analogue and digital 12- and 24-hour clocks
- solve problems involving converting from hours to minutes, minutes to seconds, years to months, weeks to days

Notes and guidance (non-statutory)

Pupils build on their understanding of place value and decimal notation to record metric measures, including money.

They use multiplication to convert from larger to smaller units.

Perimeter can be expressed algebraically as $2(a + b)$ where a and b are the dimensions in the same unit.

They relate area to arrays and multiplication.

Geometry - properties of shapes

Pupils should be taught to:

- compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes
- identify acute and obtuse angles and compare and order angles up to 2 right angles by size
- identify lines of symmetry in 2-D shapes presented in different orientations
- complete a simple symmetric figure with respect to a specific line of symmetry

Notes and guidance (non-statutory)

Pupils continue to classify shapes using geometrical properties, extending to classifying different triangles (for example, isosceles, equilateral, scalene) and quadrilaterals (for example, parallelogram, rhombus, trapezium).

Pupils compare and order angles in preparation for using a protractor and compare lengths and angles to decide if a polygon is regular or irregular.

Pupils draw symmetric patterns using a variety of media to become familiar with different orientations of lines of symmetry; and recognise line symmetry in a variety of diagrams, including where the line of symmetry does not dissect the original shape.

Geometry - position and direction

Pupils should be taught to:

- describe positions on a 2-D grid as coordinates in the first quadrant
- describe movements between positions as translations of a given unit to the left/right and up/down
- plot specified points and draw sides to complete a given polygon

Notes and guidance (non-statutory)

Pupils draw a pair of axes in one quadrant, with equal scales and integer labels. They read, write and use pairs of co-ordinates, for example (2, 5), including using co-ordinate-plotting ICT tools.

Statistics

Pupils should be taught to:

- interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs
- solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs

Notes and guidance (non-statutory)

Pupils understand and use a greater range of scales in their representations.

Pupils begin to relate the graphical representation of data to recording change over time.

Upper key stage 2 - years 5 and 6

The principal focus of mathematics teaching in upper key stage 2 is to ensure that pupils extend their understanding of the number system and place value to include larger integers. This should develop the connections that pupils make between multiplication and division with fractions, decimals, percentages and ratio.

At this stage, pupils should develop their ability to solve a wider range of problems, including increasingly complex properties of numbers and arithmetic, and problems demanding efficient written and mental methods of calculation. With this foundation in arithmetic, pupils are introduced to the language of algebra as a means for solving a variety of problems. Teaching in geometry and measures should consolidate and extend knowledge developed in number. Teaching should also ensure that pupils classify shapes with increasingly complex geometric properties and that they learn the vocabulary they need to describe them.

By the end of year 6, pupils should be fluent in written methods for all 4 operations, including long multiplication and division, and in working with fractions, decimals and percentages.

Pupils should read, spell and pronounce mathematical vocabulary correctly.

Year 5 programme of study

Number - number and place value

Pupils should be taught to:

- read, write, order and compare numbers to at least 1,000,000 and determine the value of each digit
- count forwards or backwards in steps of powers of 10 for any given number up to 1,000,000
- interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through 0
- round any number up to 1,000,000 to the nearest 10, 100, 1,000, 10,000 and 100,000
- solve number problems and practical problems that involve all of the above
- read Roman numerals to 1,000 (M) and recognise years written in Roman numerals

Notes and guidance (non-statutory)

Pupils identify the place value in large whole numbers.

They continue to use number in context, including measurement. Pupils extend and apply their understanding of the number system to the decimal numbers and fractions that they have met so far.

They should recognise and describe linear number sequences (for example, 3, 3 $\frac{1}{2}$, 4, 4 $\frac{1}{2}$...), including those involving fractions and decimals, and find the term-to-term rule in words (for example, add $\frac{1}{2}$).

Number - addition and subtraction

Pupils should be taught to:

- add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)
- add and subtract numbers mentally with increasingly large numbers
- use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy
- solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

Notes and guidance (non-statutory)

Pupils practise using the formal written methods of columnar addition and subtraction with increasingly large numbers to aid fluency (see [mathematics appendix 1 \(PDF, 248KB\)](#)).

They practise mental calculations with increasingly large numbers to aid fluency (for example, $12,462 - 2,300 = 10,162$).

Number - multiplication and division

Pupils should be taught to:

- identify multiples and factors, including finding all factor pairs of a number, and common factors of 2 numbers
- know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers
- establish whether a number up to 100 is prime and recall prime numbers up to 19
- multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers
- multiply and divide numbers mentally, drawing upon known facts
- divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context

- multiply and divide whole numbers and those involving decimals by 10, 100 and 1,000
- recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3})
- solve problems involving multiplication and division, including using their knowledge of factors and multiples, squares and cubes
- solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign
- solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates

Notes and guidance (non-statutory)

Pupils practise and extend their use of the formal written methods of short multiplication and short division (see [mathematics appendix 1 \(PDF, 248KB\)](#)). They apply all the multiplication tables and related division facts frequently, commit them to memory and use them confidently to make larger calculations.

They use and understand the terms factor, multiple and prime, square and cube numbers.

Pupils interpret non-integer answers to division by expressing results in different ways according to the context, including with remainders, as fractions, as decimals or by rounding (for example, $98 \div 4 = [\text{Fraction:}98/4] = 24 \text{ r } 2 = 24[\text{Fraction:}1/2] = 24.5 \approx 25$).

Pupils use multiplication and division as inverses to support the introduction of ratio in year 6, for example, by multiplying and dividing by powers of 10 in scale drawings or by multiplying and dividing by powers of a 1,000 in converting between units such as kilometres and metres.

Distributivity can be expressed as $a(b + c) = ab + ac$.

They understand the terms factor, multiple and prime, square and cube numbers and use them to construct equivalence statements (for example, $4 \times 35 = 2 \times 2 \times 35$; $3 \times 270 = 3 \times 3 \times 9 \times 10 = 9^2 \times 10$).

Pupils use and explain the equals sign to indicate equivalence, including in missing number problems (for example $13 + 24 = 12 + 25$; $33 = 5 \times ?$).

Number - fractions (including decimals and percentages)

Pupils should be taught to:

- compare and order fractions whose denominators are all multiples of the same number
- identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths
- recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number [for example, $[\text{Fraction:}2/5] + [\text{Fraction:}4/5] = [\text{Fraction:}6/5] = 1 [\text{Fraction:}1/5]$]
- add and subtract fractions with the same denominator, and denominators that are multiples of the same number

- multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams
- read and write decimal numbers as fractions [for example, $0.71 = \frac{71}{100}$]
- recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents
- round decimals with 2 decimal places to the nearest whole number and to 1 decimal place
- read, write, order and compare numbers with up to 3 decimal places
- solve problems involving number up to 3 decimal places
- recognise the per cent symbol (%) and understand that per cent relates to 'number of parts per 100', and write percentages as a fraction with denominator 100, and as a decimal fraction
- solve problems which require knowing percentage and decimal equivalents of $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{2}{5}$, $\frac{4}{5}$ and those fractions with a denominator of a multiple of 10 or 25

Notes and guidance (non-statutory)

Pupils should be taught throughout that percentages, decimals and fractions are different ways of expressing proportions.

They extend their knowledge of fractions to thousandths and connect to decimals and measures.

Pupils connect equivalent fractions > 1 that simplify to integers with division and other fractions > 1 to division with remainders, using the number line and other models, and hence move from these to improper and mixed fractions.

Pupils connect multiplication by a fraction to using fractions as operators (fractions of), and to division, building on work from previous years. This relates to scaling by simple fractions, including fractions > 1 .

Pupils practise adding and subtracting fractions to become fluent through a variety of increasingly complex problems. They extend their understanding of adding and subtracting fractions to calculations that exceed 1 as a mixed number.

Pupils continue to practise counting forwards and backwards in simple fractions.

Pupils continue to develop their understanding of fractions as numbers, measures and operators by finding fractions of numbers and quantities.

Pupils extend counting from year 4, using decimals and fractions including bridging 0, for example on a number line.

Pupils say, read and write decimal fractions and related tenths, hundredths and thousandths accurately and are confident in checking the reasonableness of their answers to problems.

They mentally add and subtract tenths, and one-digit whole numbers and tenths.

They practise adding and subtracting decimals, including a mix of whole numbers and decimals, decimals with different numbers of decimal places, and complements of 1 (for example, $0.83 + 0.17 = 1$).

Pupils should go beyond the measurement and money models of decimals, for example, by solving puzzles involving decimals.

Pupils should make connections between percentages, fractions and decimals (for example, 100% represents a whole quantity and 1% is [Fraction:1/100], 50% is [Fraction:50/100], 25% is [Fraction:25/100]) and relate this to finding 'fractions of'.

Measurement

Pupils should be taught to:

- convert between different units of metric measure [for example, kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre]
- understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints
- measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres
- calculate and compare the area of rectangles (including squares), including using standard units, square centimetres (cm²) and square metres (m²), and estimate the area of irregular shapes
- estimate volume [for example, using 1 cm³ blocks to build cuboids (including cubes)] and capacity [for example, using water]
- solve problems involving converting between units of time
- use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling

Notes and guidance (non-statutory)

Pupils use their knowledge of place value and multiplication and division to convert between standard units.

Pupils calculate the perimeter of rectangles and related composite shapes, including using the relations of perimeter or area to find unknown lengths. Missing measures questions such as these can be expressed algebraically, for example $4 + 2b = 20$ for a rectangle of sides 2 cm and b cm and perimeter of 20cm.

Pupils calculate the area from scale drawings using given measurements.

Pupils use all 4 operations in problems involving time and money, including conversions (for example, days to weeks, expressing the answer as weeks and days).

Geometry - properties of shapes

Pupils should be taught to:

- identify 3-D shapes, including cubes and other cuboids, from 2-D representations
- know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles
- draw given angles, and measure them in degrees (°)

- identify:
 - angles at a point and 1 whole turn (total 360°)
 - angles at a point on a straight line and half a turn (total 180°)
 - other multiples of 90°
 - use the properties of rectangles to deduce related facts and find missing lengths and angles
 - distinguish between regular and irregular polygons based on reasoning about equal sides and angles

Notes and guidance (non-statutory)

Pupils become accurate in drawing lines with a ruler to the nearest millimetre, and measuring with a protractor. They use conventional markings for parallel lines and right angles.

Pupils use the term diagonal and make conjectures about the angles formed between sides, and between diagonals and parallel sides, and other properties of quadrilaterals, for example using dynamic geometry ICT tools.

Pupils use angle sum facts and other properties to make deductions about missing angles and relate these to missing number problems.

Geometry - position and direction

Pupils should be taught to:

- identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed

Notes and guidance (non-statutory)

Pupils recognise and use reflection and translation in a variety of diagrams, including continuing to use a 2-D grid and coordinates in the first quadrant. Reflection should be in lines that are parallel to the axes.

Statistics

Pupils should be taught to:

- solve comparison, sum and difference problems using information presented in a line graph
- complete, read and interpret information in tables, including timetables

Notes and guidance (non-statutory)

Pupils connect their work on coordinates and scales to their interpretation of time graphs.

They begin to decide which representations of data are most appropriate and why.

Year 6 programme of study

Number - number and place value

Pupils should be taught to:

- read, write, order and compare numbers up to 10,000,000 and determine the value of each digit
- round any whole number to a required degree of accuracy
- use negative numbers in context, and calculate intervals across 0
- solve number and practical problems that involve all of the above

Notes and guidance (non-statutory)

Pupils use the whole number system, including saying, reading and writing numbers accurately.

Number - addition, subtraction, multiplication and division

Pupils should be taught to:

- multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication
- divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context
- divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context
- perform mental calculations, including with mixed operations and large numbers
- identify common factors, common multiples and prime numbers
- use their knowledge of the order of operations to carry out calculations involving the 4 operations
- solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why
- solve problems involving addition, subtraction, multiplication and division
- use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy

Notes and guidance (non-statutory)

Pupils practise addition, subtraction, multiplication and division for larger numbers, using the formal written methods of columnar addition and subtraction, short and long multiplication, and short and long division (see [mathematics appendix 1 \(PDF, 248KB\)](#)).

They undertake mental calculations with increasingly large numbers and more complex calculations.

Pupils continue to use all the multiplication tables to calculate mathematical statements in order to maintain their fluency.

Pupils round answers to a specified degree of accuracy, for example, to the nearest 10, 20, 50, etc, but not to a specified number of significant figures.

Pupils explore the order of operations using brackets; for example, $2 + 1 \times 3 = 5$ and $(2 + 1) \times 3 = 9$.

Common factors can be related to finding equivalent fractions.

Number - Fractions (including decimals and percentages)

Pupils should be taught to:

- use common factors to simplify fractions; use common multiples to express fractions in the same denomination
- compare and order fractions, including fractions > 1
- add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions
- multiply simple pairs of proper fractions, writing the answer in its simplest form [for example, $[\text{Fraction:}1/4] \times [\text{Fraction:}1/2] = [\text{Fraction:}1/8]$]
- divide proper fractions by whole numbers [for example, $[\text{Fraction:}1/3] \div 2 = [\text{Fraction:}1/6]$]
- associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example, $[\text{Fraction:}3/8]$]
- identify the value of each digit in numbers given to 3 decimal places and multiply and divide numbers by 10, 100 and 1,000 giving answers up to 3 decimal places
- multiply one-digit numbers with up to 2 decimal places by whole numbers
- use written division methods in cases where the answer has up to 2 decimal places
- solve problems which require answers to be rounded to specified degrees of accuracy
- recall and use equivalences between simple fractions, decimals and percentages, including in different contexts

Notes and guidance (non-statutory)

Pupils should practise, use and understand the addition and subtraction of fractions with different denominators by identifying equivalent fractions with the same denominator. They should start with fractions where the denominator of one fraction is a multiple of the other (for example, $[\text{Fraction:}1/2] + [\text{Fraction:}1/8] = [\text{Fraction:}5/8]$) and progress to varied and increasingly complex problems.

Pupils should use a variety of images to support their understanding of multiplication with fractions. This follows earlier work about fractions as operators (fractions of), as numbers, and as equal parts of objects, for example as parts of a rectangle.

Pupils use their understanding of the relationship between unit fractions and division to work backwards by multiplying a quantity that represents a unit fraction to find the whole quantity (for example, if quarter of a length is 36cm, then the whole length is $36 \times 4 = 144\text{cm}$). They practise calculations with simple fractions and decimal fraction equivalents to aid fluency, including listing equivalent fractions to identify fractions with common denominators.

Pupils can explore and make conjectures about converting a simple fraction to a decimal fraction (for example, $3 \div 8 = 0.375$). For simple fractions with recurring decimal equivalents, pupils learn about rounding the decimal to three decimal places, or other appropriate approximations depending on the context. Pupils multiply and divide numbers with up to 2 decimal places by one-digit and two-digit whole numbers. Pupils multiply decimals by whole numbers, starting with the simplest cases, such as $0.4 \times 2 = 0.8$, and in practical contexts, such as measures and money.

Pupils are introduced to the division of decimal numbers by one-digit whole numbers, initially, in practical contexts involving measures and money. They recognise division calculations as the inverse of multiplication.

Pupils also develop their skills of rounding and estimating as a means of predicting and checking the order of magnitude of their answers to decimal calculations. This includes rounding answers to a specified degree of accuracy and checking the reasonableness of their answers.

Ratio and proportion

Pupils should be taught to:

- solve problems involving the relative sizes of 2 quantities where missing values can be found by using integer multiplication and division facts
- solve problems involving the calculation of percentages [for example, of measures and such as 15% of 360] and the use of percentages for comparison
- solve problems involving similar shapes where the scale factor is known or can be found
- solve problems involving unequal sharing and grouping using knowledge of fractions and multiples

Notes and guidance (non-statutory)

Pupils recognise proportionality in contexts when the relations between quantities are in the same ratio (for example, similar shapes and recipes).

Pupils link percentages or 360° to calculating angles of pie charts.

Pupils should consolidate their understanding of ratio when comparing quantities, sizes and scale drawings by solving a variety of problems. They might use the notation $a:b$ to record their work.

Pupils solve problems involving unequal quantities, for example, 'for every egg you need 3 spoonfuls of flour', '[Fraction:3/5] of the class are boys'. These problems are the foundation for later formal approaches to ratio and proportion.

Algebra

Pupils should be taught to:

- use simple formulae
- generate and describe linear number sequences
- express missing number problems algebraically
- find pairs of numbers that satisfy an equation with 2 unknowns
- enumerate possibilities of combinations of 2 variables

Notes and guidance (non-statutory)

Pupils should be introduced to the use of symbols and letters to represent variables and unknowns in mathematical situations that they already understand, such as:

- missing numbers, lengths, coordinates and angles
- formulae in mathematics and science
- equivalent expressions (for example, $a + b = b + a$)
- generalisations of number patterns
- number puzzles (for example, what 2 numbers can add up to)

Measurement

Pupils should be taught to:

- solve problems involving the calculation and conversion of units of measure, using decimal notation up to 3 decimal places where appropriate
- use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to 3 decimal places
- convert between miles and kilometres
- recognise that shapes with the same areas can have different perimeters and vice versa
- recognise when it is possible to use formulae for area and volume of shapes
- calculate the area of parallelograms and triangles

- calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm^3) and cubic metres (m^3), and extending to other units [for example, mm^3 and km^3]

Notes and guidance (non-statutory)

Pupils connect conversion (for example, from kilometres to miles) to a graphical representation as preparation for understanding linear/proportional graphs.

They know approximate conversions and are able to tell if an answer is sensible.

Using the number line, pupils use, add and subtract positive and negative integers for measures such as temperature.

They relate the area of rectangles to parallelograms and triangles, for example, by dissection, and calculate their areas, understanding and using the formulae (in words or symbols) to do this.

Pupils could be introduced to compound units for speed, such as miles per hour, and apply their knowledge in science or other subjects as appropriate.

Geometry - properties of shapes

Pupils should be taught to:

- draw 2-D shapes using given dimensions and angles
- recognise, describe and build simple 3-D shapes, including making nets
- compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons
- illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius
- recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles

Notes and guidance (non-statutory)

Pupils draw shapes and nets accurately, using measuring tools and conventional markings and labels for lines and angles.

Pupils describe the properties of shapes and explain how unknown angles and lengths can be derived from known measurements.

These relationships might be expressed algebraically for example, $d = 2 \times r$; $a = 180 - (b + c)$.

Geometry - position and direction

Pupils should be taught to:

- describe positions on the full coordinate grid (all 4 quadrants)
- draw and translate simple shapes on the coordinate plane, and reflect them in the axes

Notes and guidance (non-statutory)

Pupils draw and label a pair of axes in all 4 quadrants with equal scaling. This extends their knowledge of one quadrant to all 4 quadrants, including the use of negative numbers.

Pupils draw and label rectangles (including squares), parallelograms and rhombuses, specified by coordinates in the four quadrants, predicting missing coordinates using the properties of shapes. These might be expressed algebraically for example, translating vertex (a, b) to $(a - 2, b + 3)$; (a, b) and $(a + d, b + d)$ being opposite vertices of a square of side d .

Statistics

Pupils should be taught to:

- interpret and construct pie charts and line graphs and use these to solve problems
- calculate and interpret the mean as an average

Notes and guidance (non-statutory)

Pupils connect their work on angles, fractions and percentages to the interpretation of pie charts.

Pupils both encounter and draw graphs relating 2 variables, arising from their own enquiry and in other subjects.

They should connect conversion from kilometres to miles in measurement to its graphical representation.

Pupils know when it is appropriate to find the mean of a data set.