Number Sense

To calculate Number Bonds to 20, we use the Number Sense Maths Programme. The systematic and structured programme ensures children develop visual models of number, a deep understanding of number and number relationships, and fluency in addition and subtraction facts.

The Number Facts Fluency Programme teaches a defined set of addition and subtraction facts and a defined set of calculation strategies, leaving nothing to chance. There is a big emphasis on part-part-whole models and additive relationships (flexibility and fluidity between + and -) and building rapid recall of known facts and derived facts (moving on from counting).

These strategies are taught as part of our 15-minute daily “Fluency Blast”.

Research Principles

The Number Sense Maths programmes are informed by research into children's attainment of number sense, children's attainment of fluency in addition and subtraction facts, and children's attainment of fluency in multiplication facts. Certain research principles underpin the programme:

1. The automatic retrieval of basic maths facts is critical to solving complex maths problems.
2. Children benefit from moving beyond counting in ones to solve addition and subtraction facts. Not doing so is associated with low attainment.
3. We have an innate ability to process quantities visually. We can use this to support our learning of addition and subtraction facts.
4. Developing an understanding of part whole relationships supports fluency in number facts.
5. Using a derived fact strategy approach is the best way to commit addition and subtraction facts to memory.
6. Systematic teaching of derived fact strategies is effective for all, including children identified as low attainers.
7. Teaching derived fact strategies leads not only to fluency in number facts, but also to an understanding of number relationships.
8. Evidence of learning and applying strategies as a route to fluency is mainly from research with additive facts.

Defined set of facts

At the core of the programme are the Addition and Subtraction Fact Grids. These essential facts are the equivalent of times tables for addition and subtraction. Just as all multiplication and division calculations use root times table facts, all future addition and subtraction calculations use these root addition and subtraction facts.

Addition Grid Facts

+	0	1	2	3	4	5	6	7	8	9	10
0	0+0	0+1	0+2	0+3	0+4	0+5	0+6	0+7	0+8	0+9	0+10
1	1+0	1+1	1+2	1+3	1+4	1+5	1+6	1+7	1+8	1+9	1+10
2	2+0	2+1	2+2	2+3	2+4	2+5	2+6	2+7	2+8	2+9	2+10
3	3+0	3+1	3+2	3+3	3+4	3+5	3+6	3+7	3+8	3+9	3+10
4	4+0	4+1	4+2	4+3	4+4	4+5	4+6	4+7	4+8	4+9	4+10
5	5+0	5+1	5+2	5+3	5+4	5+5	5+6	5+7	5+8	5+9	5+10
6	6+0	6+1	6+2	6+3	6+4	6+5	6+6	6+7	6+8	6+9	6+10
7	7+0	7+1	7+2	7+3	7+4	7+5	7+6	7+7	7+8	7+9	7+10
8	8+0	8+1	8+2	8+3	8+4	8+5	8+6	8+7	8+8	8+9	8+10
9	9+0	9+1	9+2	9+3	9+4	9+5	9+6	9+7	9+8	9+9	9+10
10	10+0	10+1	10+2	10+3	10+4	10+5	10+6	10+7	10+8	10+9	10+10

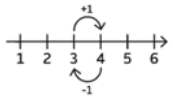
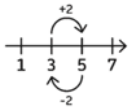
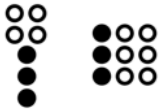
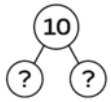
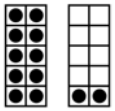
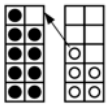
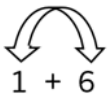
Subtraction Grid Facts

+	0	1	2	3	4	5	6	7	8	9	10
0	0-0										
1	1-0	1-1									
2	2-0	2-1	2-2								
3	3-0	3-1	3-2	3-3							
4	4-0	4-1	4-2	4-3	4-4						
5	5-0	5-1	5-2	5-3	5-4	5-5					
6	6-0	6-1	6-2	6-3	6-4	6-5	6-6				
7	7-0	7-1	7-2	7-3	7-4	7-5	7-6	7-7			
8	8-0	8-1	8-2	8-3	8-4	8-5	8-6	8-7	8-8		
9	9-0	9-1	9-2	9-3	9-4	9-5	9-6	9-7	9-8	9-9	
10	10-0	10-1	10-2	10-3	10-4	10-5	10-6	10-7	10-8	10-9	10-10
11		11-1	11-2	11-3	11-4	11-5	11-6	11-7	11-8	11-9	11-10
12			12-2	12-3	12-4	12-5	12-6	12-7	12-8	12-9	12-10
13				13-3	13-4	13-5	13-6	13-7	13-8	13-9	13-10
14					14-4	14-5	14-6	14-7	14-8	14-9	14-10
15						11-5	15-6	15-7	15-8	15-9	15-10
16							16-6	16-7	16-8	16-9	16-10
17								17-7	17-8	17-9	17-10
18									18-8	18-9	18-10
19										19-9	19-10
20											20-10

Calculation Strategies

Defined set of strategies

The core facts are taught alongside 12 calculation strategies. Learning and applying these strategies gives children a deep understanding of number and number relationships. Using these strategies children can then "use what they know to work out what they don't know". Explicit teaching of derived fact strategies is an effective route to fluency in addition and subtraction facts for all children, including lower attainers

One More, One Less 	When we add one, we get the next counting number. When we subtract one, we get the previous counting number (e.g. 5 – 1 = 4).	Number Neighbours: Spot the Difference 	Adjacent numbers have a difference of 1. Adjacent odds and evens have a difference of 2. Spot number neighbours (adjacent, odds or evens) to solve subtractions of adjacent numbers (e.g. 5 – 4 = 1), of adjacent odds (e.g. 9 – 7 = 2) or adjacent evens (e.g. 6 – 4 = 2)
Two More, Two Less: Think Odds and Evens 	If we add two to a number, we go from odd to next odd or even to next even. If we subtract two from a number, we go from odd to previous odd or even to previous even.	7 Tree and 9 Square 	Use these visual images to remember addition and subtractions fact families that children can find tricky. For example, visualising the 7 tree helps remember that 7 – 3 = 4. Visualising the 9 square helps remember that 3 + 6 = 9.
Number 10 Fact Families 	Go beyond just recalling the pairs of numbers that add to 10. Make sure that we can also spot additions and subtractions which we can use number bonds to 10 to solve.	Ten and A Bit 	The numbers 11 – 20 are made up of 'Ten and a Bit'. Recognising and understanding the 'Ten and a Bit' structure of these numbers enables addition and subtraction facts involving their constituent parts (e.g. 3 + 10 = 13, 17 – 7 = 10, 12 – 10 = 2).
Five and A Bit 	The numbers 6, 7, 8 and 9 are made up of 'five and a bit'. This can be shown on hands, and supports decomposition of these numbers into their five and a bit parts (e.g. 5 + 3 = 8, 9 – 5 = 4).	Make Ten and Then... 	Additions which cross the 10 boundary can be calculated by 'Making Ten' first, and then adding on the remaining amount (e.g. 8 + 6 can be calculated by thinking '8 + 2 = 10 and 4 more makes 14'). The same strategy can be applied to subtractions through 10.
Know about 0 	When we add 0 to or subtract 0 from another number, the total remains the same. If we subtract a number from itself, the difference is 0.	Adjust It 	Any addition and subtraction can be calculated by adjusting from a fact you know already, (e.g. 6 + 9 is one less than 6 + 10).
Doubles and Near Doubles 	Memorise doubles of numbers to 10, using a visual approach. Then use these known double facts to calculate near doubles and hidden doubles. Once we know 6 + 6 = 12 then 6 +7 and 5 + 7 is easy.	Swap It 	When the order of two numbers being added (addends) is exchanged the total remains the same. E.g. 1 + 8 = 8 + 1. Sometimes reversing the order of the two addends makes addition easier to think about conceptually.

Number Sense Maths

Defined Sequence

The programme teaches every addition and subtraction fact systematically. Just as schools can tell you where they teach each grapheme-phoneme correspondence in phonics, the Number Sense Maths Fluency Programme systematically teaches the facts and strategies leaving nothing to chance. Stages 1-4 are taught in Reception and Year 1 and stages 5 and 6 are taught in Year 2.

	Stage	Book
1	Visual Number Foundations	Subitising 1-5 · Subitising 6-10 · Subitising on tens frames
2	Make and Break Numbers to 10	Make and Break 5 · Make and Break 4,3&2 · Make and Break 10 · Make and Break 6 · Make and Break 7 · Make and Break 8 · Make and Break 9
3	Facts and Strategies Within 10	One More, One Less · Two More, Two Less: Think Odds and Evens · Number 10 Fact Families · Five and A Bit · Know About Zero · Doubles and Near Doubles · Number Neighbours: Spot the Difference · 7 Tree and 9 Square · Strategy Selection
4	Ten and A Bit Facts and Strategy	Ten and A Bit
5	Facts and Strategies Across 10	Make 10 and Then: Addition · Make 10 and Then: Subtraction · More Doubles and Near Doubles · Adjusting · Strategy Selection · Make 10 and Then: Subtraction Part 2 · Strategy Selection Part 2
6	Extending Facts and Strategies	Calculating with Multiples of 10 · Two-Digit Numbers: Calculating with Ones · Two-Digit Numbers: Calculating with Tens · Make the Next 10 and Then: Addition · Make the Next 10 and Then: Subtraction · Strategy Selection

Progression Overview:

The facts and strategies are brought together in a six stage teaching programme. Each stage of the programme is broken down into smaller teaching steps, with resources provided for every step. The resources for each step include

- Teaching Points which explain what children need to learn in each step, and the models used
- Activities, for both the classroom and at home, which consolidate concepts
- Animations that expose mathematical structure and develop number sense
- Exercises that build progressively with scaffolding for children and talking tips to support teachers and parents

Stage	Year	Focus of stage
Stage 1 Visual Number Foundations	Year 1	• Building a deep and visual understanding of numbers 1-10 • Subitising quantities 1 – 5, and subitising structured arrangements for quantities 6-10 • Recognising quantities 1-10 twos-wise and fives-wise on tens frames
		Assessment check point
Stage 2 Make and Break Numbers to 10		• Exploring the different ways that every number to 10 can be broken into parts and put back together • Starting to remember some facts • Introducing addition and subtraction equations
Stage 3 Facts and Strategies within 10		• Learning calculation strategies for adding and subtracting within 10 • Learning to use what you know to work out what you don't yet know • Achieving fluency in addition and subtraction facts within 10
		Assessment check point
Stage 4 Ten and A Bit		• Building a deep and visual understanding of the numbers and quantities 11 to 20 • Understanding the concept of place value • Learning the Ten and a Bit calculation strategy
		Assessment check point
Stage 5 Facts and Strategies across 10	Year 2	• Learning the remaining calculation strategies • Practicing strategy selection to promote efficient and flexible thinking • Achieving fluency in addition and subtraction facts across 10
		Assessment check point
Stage 6 Extending Facts and Strategies		• Learning to extend and apply key facts and strategies to addition and subtraction calculations involving 2-digit numbers
		Assessment check point
Consolidation	Year 3 Autumn Term	• Review and consolidation of Stage 5 and Stage 6 to secure fluency in facts across 10 and in 2-digit mental calculation

Number Sense Maths