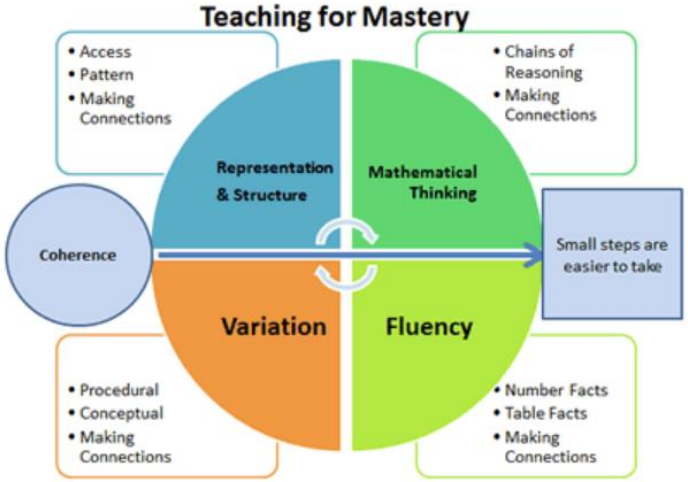
Fluency Guidance

Reviewed: Apr 2020

Next Review: Apr 2022

M.Wiley Apr 2020



Fluency

Quick and efficient recall of facts and procedures and the flexibility to move between different contexts and representations of mathematics

Key facts such as multiplication tables and addition facts within 10 are learnt to automaticity to avoid cognitive overload in the working memory and enable pupils to focus on new concepts

Children develop a strong sense of number relationships, an important prerequisite for procedural fluency.

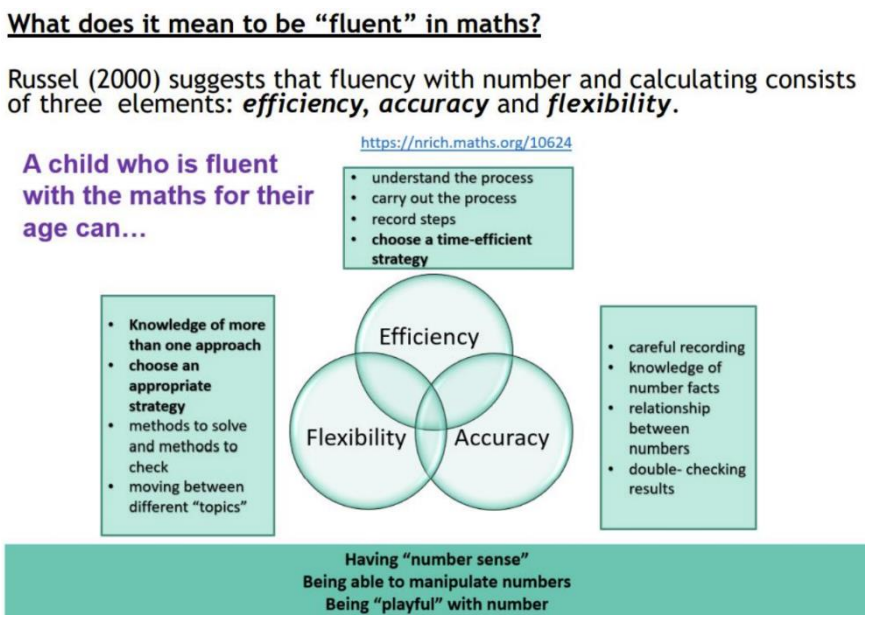
"Students exhibit computational fluency when they demonstrate flexibility in the computational methods they choose, understand and can explain these methods, and produce accurate answers efficiently." (McClure, 2014)

Russell (2000) suggests fluency consists of three elements: <u>efficiency, accuracy and flexibility.</u>
It demands more of students than memorising a single procedure.

- **they need to <u>understand why they are doing what they are doing</u>**
- **know <u>when it is appropriate to use different methods.</u>**

M.Wiley Apr 2020

Children need to be both procedurally and conceptually fluent- they need to know both how and why. Children who engage in a lot of practice without understanding what they are doing often forget, or remember the procedures incorrectly. (McClure, 2014)



Supporting children to become fluent

Manipulatives- children need to explore with them and make meaningful connections to mental and recorded calculation over time. The meaning is not in the manipulative itself- they should be chosen carefully to help the children see the maths.

Discussion- quality of talk is important, describing why and how it worked, looking how their method is the same or different to those of others. Comparing, explaining, justifying are higher level skills that pupils need opportunities to develop and practice. This will help them make meaningful connections.

Consolidation in meaningful contexts- practice in context helps pupils make links between the types of situations a particular strategy might suit, therefore developing "mathematical memory" which different from simply rote memorising.

M.Wiley Apr 2020

Number Sense Maths

Number Sense Maths (NSM) provides the structure and materials for daily number fact teaching in KS1. The programme gives addition and subtraction facts the focus they need for children to become fluent in them, just as phonics gets the focus it needs to teach children to decode.

The Number Sense Maths programme is fully aligned with NCETM PD materials and the ready to progress criteria in the recent DfE guidance (Summer 2020).

At the core of NSM 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.

NSM teaches 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.

The facts and strategies are brought together in the six stage teaching programme, and will be taught, rehearsed and practised on a daily basis (15-20 mins), which can be taught in discrete daily factual fluency sessions, or integrated into the main maths lessons. Stages 1- 4 are taught in Year 1, and Stages 5 and 6 are taught in Year 2.

NSM maths will also be taught in KS2. In Year 3, it will be taught as in KS1 with a focus on the Y2 objectives as part of Catch up provision.

NSM strategies will also be taught in Year 4 as an intervention for identified pupils, and with SEN pupils in Y5/6 on a one to one or small group basis as required.

The school has a “keep up not catch up” mentality. Intervention may be used for small groups of pupils to reteach or give additional consolidation time, but this will be in addition to the main session to enable them to keep up.

M.Wiley Apr 2020

Mapping of NSM Number Facts stages to other curriculum resources and guidance

NSM Number Facts is a programme to develop fluency in addition and subtraction facts through teaching of quantity awareness and derived facts strategies. It intentionally does not cover the full KS1 mathematics curriculum, however developing factual fluency will make it easier for children to access the rest of the curriculum. Most schools find it easiest to start using the programme in separate daily number facts sessions. Schools who have used the programme for longer may well want to bring more NSM Number Facts content into the main maths lesson. The mapping below shows how the NSM Number Facts stages tie into other curriculum resources you may be referring to, and will particularly support schools who want to start integrating more NSM Number Facts materials into the main maths lesson, or ensure coverage of the ready-to-progress criteria.

NSM Number Facts	NCETM spines	Ready-to-progress criteria
Stage 1 Visual Number Foundations	**1.3** Composition of numbers 0 – 5 **1.4** Composition of numbers 6 - 10	
Stage 2 Make and Break Numbers to 10	**1.3** Compositions of numbers 0 – 5 **1.4** Composition of numbers 6 - 10	**1AS-1** Compose numbers to 10 from 2 parts, and partition numbers to 10 into parts, including recognising odd and even numbers
Stage 3 Facts and Strategies Within 10	**1.7** Addition and subtraction: strategies within 10	**1NF-1** Develop fluency in addition and subtraction facts within 10 **2NF-1** Secure fluency in addition and subtraction facts within 10, through continued practice
Stage 4 Ten and A Bit Facts	**1.10** Composition of numbers 11 – 19	(Feeds into **2NPV-1** Recognise the place value of each digit in two-digit numbers, and compose and decompose two-digit numbers using standard and non-standard partitioning)
Stage 5 Facts and Strategies Across 10	**1.11** Addition and subtraction: bridging 10	**2AS-1** Add and subtract across 10 **3NF-1** Secure fluency in addition and subtraction facts that bridge 10, through continued practice
Stage 6 Extending Facts and Strategies Beyond the Grids	**1.13** Addition and subtraction: two-digit and single digit numbers **1.14** Addition and subtraction: two-digit numbers and multiples of ten	**2AS-3** Add and subtract within 100 by applying related addition and subtraction facts: add and subtract only ones or only tens to/from a two-digit number

M.Wiley Apr 2020

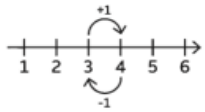
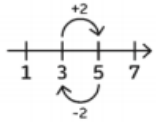
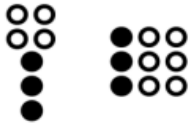
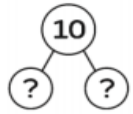
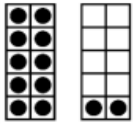
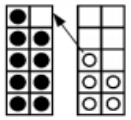
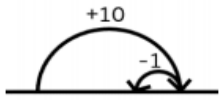
Stage	Year	Focus of stage
Stage 1 Visual Number Foundations	Year 1	• Building a deep and visual understanding of numbers 1-10 • Subitising quantities 1 – 5, and subitising structured arrangements for quantities 6-10 • Recognising quantities 1-10 twos-wise and fives-wise on tens frames
		Assessment check 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

M.Wiley Apr 2020

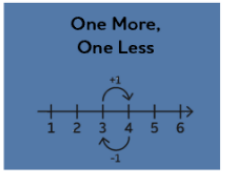
	Stage	Teaching Step
1	Visual Number Foundations	Subitising 1-5 · Subitising 6-10 · Subitising 1-10
2	Make and Break Numbers to 10	Make and Break 5 · Make and Break 4,3&2 · Make and Break 10 · Make and Break 6 · Make and Break 7 · Make and Break 8 · Make and Break 9
3	Facts and Strategies Within 10	One 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 Practice
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 Practice
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 · Make the Previous 10 and Then · Strategy Selection Practice · Preparation for Column Addition · Preparation for Column Subtraction

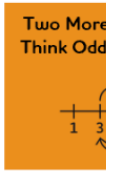
M.Wiley Apr 2020

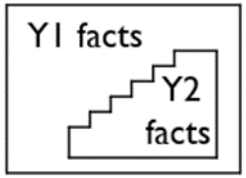
NSM Number Facts Calculation Strategies

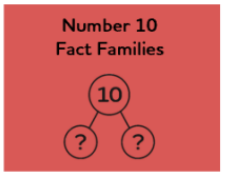
One More, One Less 	When we add one, we get the next counting number. When we subtract one, we get the previous counting number (e.g. 5 – 1 = 4).	**Number Neighbours: Spot the Difference** 	Adjacent numbers have a difference of 1. Adjacent odds and evens have a difference of 2. Spot number neighbours (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 **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**  1 + 6	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.

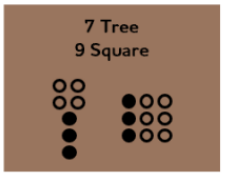
+	0	1	2	3	4	5	6	7	8	9	10
0	0 + 0	0 + 1	0 + 2	0 + 3	0 + 4	0 + 5	0 + 6	0 + 7	0 + 8	0 + 9	0 + 10
1	1 + 0	1 + 1	1 + 2	1 + 3	1 + 4	1 + 5	1 + 6	1 + 7	1 + 8	1 + 9	1 + 10
2	2 + 0	2 + 1	2 + 2	2 + 3	2 + 4	2 + 5	2 + 6	2 + 7	2 + 8	2 + 9	2 + 10
3	3 + 0	3 + 1	3 + 2	3 + 3	3 + 4	3 + 5	3 + 6	3 + 7	3 + 8	3 + 9	3 + 10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

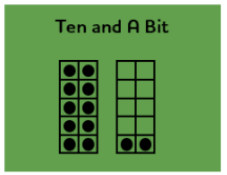


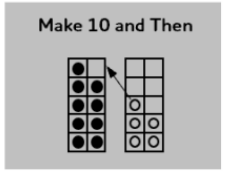


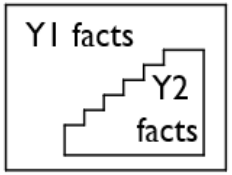






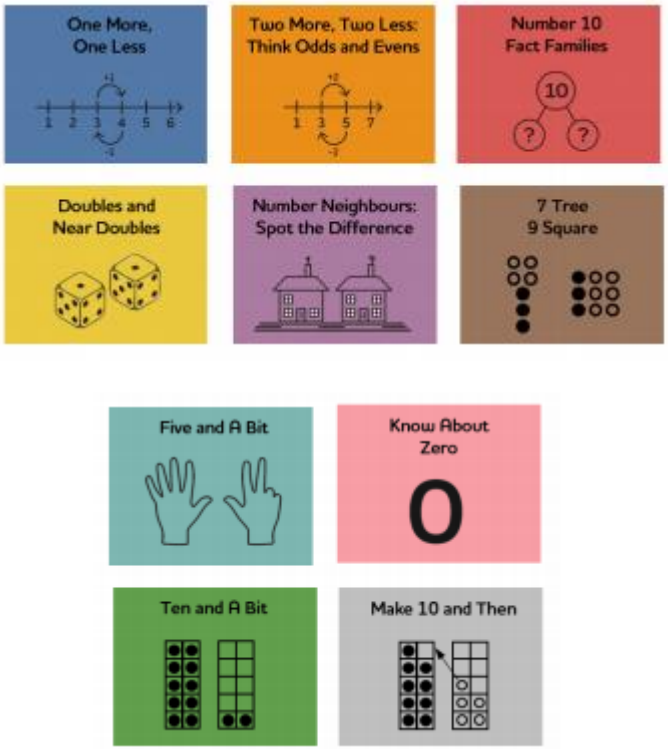






M.Wiley Apr 2020

+	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



M.Wiley Apr 2020

Year 1 Objectives

1) Count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number	**e.g. Count on from 54, Count back from 27**
2) Count, read and write numbers to 100 in numerals; count in multiples of twos, fives and tens	**e.g. Counting in 2s, what are the next three numbers after 6**
3) Given a number, identify one more and one less	**e.g. What number is one less than 54? What number is one more than 27?**
4) Read and write numbers from 1 to 20 in numerals and words	**e.g. Write the number sixteen in numerals, write the number 14 in words.**
5) Represent and use number bonds to 10 (fact families within 10)	**e.g. 5+4=9, 4+5=9, 9-5=4, 9-4=5**
6) Add and subtract one-digit numbers to 10, inc. zero	**e.g. What do you add to 7 to make 10?**
7) Double numbers to 5	**e.g. What is double 3?**
8) Halve even numbers to 10	**e.g. What is half of 8?**

Year 2 Objectives

1) Count in steps of 2 and 5 from 0, forward and backward	**e.g Counting in 2's what are the next three numbers after 12?**
2) Count in tens from any number, forward and backward	**e.g. Count in tens from 27**
3) Recognise the place value of each digit in a 2 digit number (tens, ones)	**e.g. What is the value of the 7 digit in 73?**
4) Compare and order numbers from 0 up to 100	**e.g Put the following in order, starting with the smallest number (39, 52, 31)**
5) Read and write numbers to at least 100 in numerals and words	**e.g. Write the number seventy-eight in numerals**
6) Recall and use addition and subtraction facts to 20 fluently	**e.g. Add together 9 + 8**
7) Begin to recall and use multiplication facts for 2,5 and 10x tables	**e.g. What is 9x5?**
8) Recognise odd and even numbers	**e.g. Is 79 an odd or even number?**
9) Double numbers 1-10	**e.g. What is double 7?**
10) Halve even numbers to 20	**e.g. What is half of 18?**
11) Add and subtract numbers mentally • 2 digit number and ones • 2 digit number and tens • Two 2 digit numbers • Adding 3 one digit numbers	**e.g. Add together 9, 7 and 3 (7+3= 10 then add 9)**

Mental Arithmetic KS2

Sessions on mental calculation need to be managed in a way that enables all pupils to take part. Lessons need to be organised to provide thinking time that encourages rapid, but not instant response, and supports pupil who need a bit longer to figure things out.

Successful strategies could include;

- Thinking time- insisting nobody puts hand up until a signal (silently count to 5 before giving signal)
- Show me activities using different resources- whiteboards, number fans, digit cards, Numicon etc.
- Encouraging pupils to share strategies with each other before responding- work collaboratively
- Use of apps and web-based programs where pupils can compete against themselves

Whatever activity is used, it is important to spend time discussing various strategies and identify which have been the most effective. It is also important to discuss misconceptions and have pupils identify errors, explaining what they are, and why they think they have been made. Pupils need to feel secure to do this so it is vital to create a learning environment where pupils feel secure enough to take risks and are not constrained by a fear of failure. Pupils will learn by comparing their strategies, and identifying which strategies are most effective for particular problems with particular types of number.

The learning and teaching of mental calculation strategies should be taught and reinforced through the daily oral/mental starters and weekly whole class lessons (2 x 30/45 minutes), as well as any other mental calculation times, e.g. fluency in five/tough ten/number gym during start of day activities.

M.Wiley Apr 2020

Year 3: End of Year Expectations

1) Count on from zero in multiples of 4, 8, 50 and 100	**e.g. Counting in 4's, what are the next three numbers after 20?**
2) Find 10 or 100 more or less than a given number	**e.g. What is 100 more than 786?**
3) Recognise place value of each digit in a 3 digit number (hundreds, tens, ones)	**e.g. What is the value of the 4 in 491?**
4) Compare and order numbers up to 1000	**e.g. Put the following in order, starting with the smallest: 439, 512, 431**
5) Read and write numbers up to 1000 in numerals and words	**e.g. Write the number six hundred and eight in numerals**
6) Add and subtract numbers mentally • 3 digit number and ones • 3 digit number and tens • 3 digit number and hundreds	**e.g. What is 472 + 5?** **e.g. What is 472 + 80?** **e.g. What is 472 + 300?**
7) Recognise and use number bonds/complements to 100	**e.g. 68 + ? = 100**
8) Recall and use multiplication facts for the 3,6,9 times tables	**e.g. What is 4x6? What is 24/3?**
9) Recall and use multiplication facts for the 4 and 8 times tables	**e.g. What is 6x4? What is 56/8?**

10) Write and calculate TO x O and TO / O using familiar multiplication tables	**e.g. What is 17 x 3?**
11) Double two digit numbers	**e.g. What is double 74?**
12) Halve even numbers up to 100	**e.g. What is half of 56?**
13) Count up and down in tenths	**e.g. What are the next three fractions? 9/10, 1, 1 1/10**
14) Add and subtract fractions with the same denominator within one whole	**e.g. What is 3/6 + 2/6?**
15) Compare and order unit fractions; fractions with the same denominators	**e.g. Order these fractions, starting with the smallest 3/6, 1/6, 5/6**

Year 4: End of Year Expectations

1) Count in multiples of 6,7,9,25 and 1000	**e.g. What are the next three numbers? 175, 200, 225,**
2) Find 1000 more or less than a given number	**e.g. What is 1000 more than 37,856**
3) Count backwards through zero to include negative numbers	**e.g. What are the next three numbers? 2, 1, 0,**
4) Recognise the place value of each digit in a four digit number (thousands, hundreds, tens, ones)	**e.g. What is the value of the 7 in 7,159?**
5) Order and compare numbers beyond 1000	**e.g. Order these numbers, largest first: 9716, 18178, 14984**
6) Round any number to the nearest 10, 100 or 1000	**e.g. Round 14,513 to the nearest thousand**
7) Add and subtract two digit numbers mentally	**e.g. Add together 34 and 49**
8) Add and subtract three digit numbers (tens and ones do not cross tens barrier)	**e.g. What is the sum of 413 and 823?**
9) Recall multiplication and division facts up to 12x12	**e.g. What is 7x12? What is 108/9?**
10) Use known and derived facts to multiply and divide mentally	**e.g. What is 320/4? What is 0.7x6?**
11) Use distributive law to multiply two digit numbers by one digit	**e.g. What is 37x6? (30x6 + 7x6)**
12) Multiply whole numbers by 10 and 100	**e.g. What is 467 x 100**

13) Double and halve two digit numbers	**e.g. What is double 79?**
14) Count up and down in hundredths	**e.g. What are the next three fractions? 96/100, 97/100, 98/100…**
15) Add and subtract fractions with the same denominator	**e.g. What is 6/8 + 5/8?**
16) Recognise and write decimal equivalents to ¼, ½, ¾ or any tenths or hundredths	**e.g. Write 7/100 as a decimal**
17) Find the effect of dividing a one or two digit number by 10 and 100	**e.g. What is 34 divided by 100?**
18) Round decimals with 1 d.p to the nearest whole number	**e.g. Round 3.7 to the nearest whole number**
19) Compare numbers with the same number of decimal places (up to 2 d.p)	**e.g. Order these numbers, smallest first 3.41, 3.49, 3.14**

Year 5: End of Year Expectations

1) Read, write and compare numbers to at least 1,000,000 and determine the value of each digit	**e.g. What is the value of the 6 in 681,927**
2) Count forwards and backwards in steps of powers of 10 for any given number up to 1,000,000	**e.g. Count on in 10,000s from 329,109**
3) Interpret negative numbers in context; count forwards and backwards with positive and negative whole numbers, including through zero	**e.g. Continue the sequence: -7, -14, -21**
4) Round any number up to 1,000,000 to different degrees of accuracy (from nearest 10 to nearest 100,000)	**e.g. Round 723,178 to the nearest 100,000**

5) Add and subtract numbers mentally with increasingly large numbers	**e.g. What is 12,463- 2300?**
6) Recall prime numbers between 1-20	**e.g. Write the primes between 10 and 20**
7) Multiply and divide numbers mentally using known and derived facts	**e.g. What is 175 x 8?**
8) Multiply and divide whole numbers and those involving decimals by 10,100 and 1000	**e.g. What is 35.6 x 100?**
9) Recognise and use square numbers and cube numbers	**e.g. Write 2 square numbers between 50 and 100**
10) Double and halve three digit numbers	**e.g. What is double 386? What is half of 512?**
11) Compare and order fractions whose denominators are all multiples of the same number	**e.g. Use the correct equality/inequality symbol between the fractions 7/8 ? 13/16**
12) Add and subtract fractions with the same denominator denominators that are multiples of the same number	**e.g. What is 1/8 + ¾?**
13) Read and write decimal numbers as fractions	**e.g. Express 0.71 as a fraction**
14) Round decimals with 2 d.p. to the nearest tenth and whole number	**e.g. Round 4.67 to the nearest whole number**
15) Recognise the % symbol and understand that per cent relates to "number parts per hundred" and write percentages as a fraction with denominator 100, and as a decimal	**e.g. Express 48% as a fraction with the denominator 100**
16) Know percentage and decimal equivalents of halves, quarters, fifths, tenths and twenty-fifths	**e.g. Write 17/100 as a decimal. Write 4/5 as a percentage.**

Year 6: End of Year Expectations

1) Read, write, order and compare numbers to at least 10 million and determine the value of each digit	**e.g. What is the value of the 3 in 8,239,146?**
2) Round any whole number to the required degree of accuracy	**e.g. Round 3,819,278 to the nearest million**
3) Use negative numbers in context, and calculate intervals across zero	**e.g. What is the difference between -37.4°C and 29.8°C?**
4) Perform mental calculations, including with mixed operations and large numbers	**e.g. What is 7000 x 0.9?**

5) Identify common factors, common multiples and prime numbers	**e.g. Use Venn/Carroll diagrams to classify different types of numbers; common factors of 18 and 24; common multiples of 6 and 9 less than 100**
6) Use knowledge of order of operations (BODMAS) to carry out calculations involving the four operations	**e.g. What 2+ 7 x 6?**
7) Solve addition and subtraction multi-step problems in context	**e.g. How much change from £10 if you spend £1.45 and then £2.57?**
8) Double and halve three digit numbers, including decimals	**e.g. What is double 79.6?**
9) Compare and order fractions, including fractions greater than 1	**e.g. Use the correct equality/inequality symbol between the fractions 1 and 4/6 ? 1 and 39/48**
10) Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalence	**e.g. What is 1 ¾ + 2 ½ ?**
11) Multiple pairs of proper fractions	**e.g. What is ¾ x 2/5?**
12) Divide proper fractions by whole numbers	**e.g. What is 1/3 divided by 2?**
13) Identify value of each digit in decimal numbers to 3 d.p.	**e.g. What is the value of the digit 6 in 4.265?**
14) Multiply and divide numbers by 10,100 and 1000 and give answers up to 3 d.p	**e.g. What is 47 / 1000?**
15) Multiply one digit numbers with up to 2 decimal places by whole numbers	**e.g. What is 0.09 x 12?**
16) Recall and use equivalences between fractions, decimals and percentages	**e.g. Express 78% as a fraction.**

Mental Arithmetic Assessments

- Mental Arithmetic Tests are available Years 1-6 (Rising Stars).

- Mr Bee Variation Theory Arithmetic Tests available- focus on one area with procedural variation- consider use for an area of maths pupils are finding tricky or need additional rehearsal.

- Mental maths skins are also available for teachers to develop their own shorter tests based on particular areas of learning- Mental Maths folder- Mental Arithmetic.

- It is recommended that tests (published or created) are carried out regularly during each term. These can be trimmed and stuck in books.

Daily rehearsal

- Number Sense daily sessions in KS1 and Y3, either separate or integrated into Maths lesson.

- Fluent in Five/Tough Ten available for additional daily rehearsal practice in Maths/SODA for Y1-6.

- Number Gym Bond Builder (R-Y2) opportunity for pupils to practice rapid recall in number bonds. Pupils have access both at school and at home. Excel database to store data, track progress and identify gaps.

- Number Gym Table Trainer (Y1-Y6) opportunity for pupils to practice rapid recall in times tables. Pupils have access both at school and at home. Excel database to store data, track progress and identify gaps.

- Number Gym Mental Maths Challenge (Y3-Y6) opportunity for pupils to practice rapid recall in mental arithmetic at their own level- copper, bronze, silver, gold and platinum. Pupils have access both at school and at home. Excel database to store data, track progress and identify gaps.

- TT Rockstars: opportunity for pupils to practice rapid recall in times tables. Pupils have access both at school and at home.

Planning and Assessment

- Mental maths planning should be carried out weekly as part of the weekly template.

M.Wiley Apr 2020

- Planning should be pitched appropriately- end of year group expectations are a guide and should be used where possible.
- Strategies must be taught and there must be opportunities to consolidate through rehearsal, testing and games.
- Work can be recorded in books and evidenced as written work, photographs, tests.
- Mental arithmetic lessons should not be used to go through tests- this is not a productive use of time. Choose key questions to focus on if desired.
- TagTiv8 can be used as an outdoor learning opportunity to develop and consolidate mental arithmetic skills.
- TT Rockstars should be completed as paper copies 3x per week from Y3-6 (Y2 from Summer Term onwards). Example: MON = multiplication facts (any order) TUES= division facts (any order) FRI= multiplication and division facts (any order) for the chosen x table or x tables that week (e.g. 3x and 4x). Booklets can be downloaded or generated from the TT Rockstars website to suit age/ability groups.
- Time should also be given for pupils to practice TT Rockstars or Number Gym (Table Trainer) in school. Pupils should also be encouraged to practice at home (activity logs can be monitored on the TT Rockstars and Number Gym websites).
- Ensure that multiplication and division strategies are taught (see Number Fluency policy 2021)

M.Wiley Apr 2020

Review
This policy is monitored by the maths co-ordinator and leadership team.

- Regular scrutiny of children's books of mental calculation jottings
- Regular monitoring of teaching plans to find evidence of discrete teaching of mental strategies (mental starter, mental maths lesson)
- Evaluation and review of assessment data
- Lesson observations to monitor the quality of teaching and implementation of teaching plans
- Pupil interviews

This policy will be reviewed by staff and governors at least once every two years, and reviewed whenever Government policy changes. The next review is due in April 2022.

M.Wiley Apr 2020