

Bowlee Park Community School

Fluency Policy

Date adopted: September 2021

Date of review: Annually

Fluency Policy

Fluency involves;

- Quick recall of facts and procedures
- The flexibility and fluidity to move between different contexts and representations of mathematics.
- The ability to recognise relationships and make connections in mathematics.

Fluency consists of three important elements; efficiency, accuracy and flexibility. In order to be fluent children must not become overwhelmed with too many steps and or lose the logic of the strategy. They must be able to choose an efficient strategy that they can carry out easily, keeping track of the sub-problems and making use of intermediate results to solve the problem. In order to achieve accuracy children must have a secure knowledge of number facts and if recording, must record carefully, double checking their results. Flexibility requires the knowledge and understanding of more than one approach to solving a particular kind of problem. Children need to be flexible in their approach in order to choose an appropriate strategy for the numbers involved. They must also be able to select one method for solving a problem and another method to check the results.

It is important to understand that fluency involves more than just memorising single procedures or answers. Children need to understand why they are doing what they are doing and also identify when it is appropriate to use different methods.

At Bowlee Park there is an emphasis on the importance of developing fluency with mathematical facts. Maths lessons begin with a fluency activity and children are also given regular opportunities within maths lessons to practise basic facts and develop flexibility with these facts.

A CPA (concrete – pictorial – abstract) approach is followed which supports the development of fluency with key concepts. A number of concrete, pictorial and other resources are used at Bowlee Park to develop the understanding of basic facts and help children to become fluent in basic maths facts. Children may use the following resources to help secure fluency with number facts: number fun songs, Numicon, ten frames, numberlines, hundred number squares, bead strings, bar models, part whole models, counters and Dienes apparatus. Children develop their understanding of basic facts with concrete resources first before moving on to representing numbers and facts pictorially and then abstractly. When fluency with a fact develops children will no longer need resources and will be able to automatically recall that fact within three seconds. At Bowlee Park there is a drive on fluency throughout school. This is being supported by an emphasis on concrete and pictorial representations of number in the Early Years and Year One.

1. Developing fluency in addition and subtraction facts -Why focus on fluency in addition and subtraction facts?

- A defined set of addition and subtraction facts build the basis of all additive calculation, just as times tables are the building blocks for all multiplicative calculation:

$$\begin{array}{r} 36 + 45 \\ \hline 70 + 11 = 81 \end{array}$$

Informal/mental addition by partitioning:

Root addition facts

$$3 + 4, 6 + 5$$

$$\begin{array}{r} 35 \cancel{1} 2 \\ - 124 \\ \hline 238 \end{array}$$

Formal subtraction with column method

Root subtraction facts

$$12 - 4, 5 - 2, 3 - 1$$

- If children are not fluent in these facts, then when they are solving more complex problems the working memory is taken up by calculating basic facts, and children have less working memory to

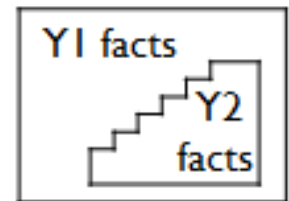
focus on solving the actual problem so fluency in basic facts allows children to tackle more complex maths more effectively.

- Fluency is one of the 3 aims of the national curriculum, and external tests focus heavily on fluency.
- Children need to be taught strategies to solve these facts. If children aren't explicitly taught to solve e.g. $6+7$ by thinking 'double 6 and one more' or to solve $12-8$ by thinking '2 more and 2 more again' then most children will use inefficient counting based approaches.

What facts do children need to be fluent in?

Children need to be fluent in the following addition 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	$10+0$	$10+1$	$10+2$	$10+3$	$10+4$	$10+5$	$10+6$	$10+7$	$10+8$	$10+9$	$10+10$



These are the corresponding subtraction facts:

-	0	1	2	3	4	5	6	7	8	9	10
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						$15-5$	$15-6$	$15-7$	$15-8$	$15-9$	$15-10$
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											$20-10$

Note that not all subtractions within 20 are root facts, e.g. $17-5$ is not considered a root fact ($7-5$ is the root fact for this).

The majority of these facts will be learnt in Yr1&2. In Reception, children become fluent in working with totals to 5 (though not recording as equations), e.g. "Show me 5 on your hands. Now show me 5 in a different way." Year 3 will need to focus on securing fluency in subtraction facts which bridge 10. Although this is a Year 2 objective, aiming for real fluency in subtraction facts such as $14-9$ and $13-5$ (where fluency is an answer in 3 seconds) requires securing in Yr 3.

Does fluency just mean memorisation?

Not necessarily – most rely on very quick use of strategies to solve some of them. Fluency can mean getting an answer quickly and with limited demands on working memory.

Most facts which don't bridge 10 are memorised, $4+5=9$ or $2+6=8$ for example.

For facts which bridge 10, the picture is more complex and many of the facts which bridge 10 are quickly derived using strategies (but still in less than 3 seconds).

- o Double 6, 7 8 and 9 can be memorised in fluent children.
- o Many fluent children may 'just know' that $9+3=12$ and $8+4=12$ and relate this to their times table/skip counting knowledge.
- o Fluent children use strategies for many of the other facts. Eg $9+8$ –with fluency this can be solved through very quickly applying a strategy: bridging, near doubles or compensating.

The grid below demonstrates approaches taken by a fluent, high attaining Year 4 child to each of the addition facts: no counting approach was used for any of the facts, but they are not memorised either (K= Known fact; S= Strategy).

	0	1	2	3	4	5	6	7	8	9	10
0	K	K	K	K	K	K	K	K	K	K	K
1	K	K	K	K	K	K	K	K	K	K	K
2	K	K	K	K	K	K	K	K	K	K	K
3	K	K	K	K	K	K	K	K	S	S	K
4	K	K	K	K	K	K	K	S	K	S	K
5	K	K	K	K	K	K	S	S	S	S	K
6	K	K	K	K	K	S	S	K	S	S	K
7	K	K	K	K	S	S	S	K	S	S	K
8	K	K	K	S	K	S	S	S	K	S	K
9	K	K	K	S	S	S	S	S	S	K	K
10	K	K	K	K	K	K	K	K	K	K	K

Notes on strategies used

Predominantly bridging

Difference of 2 converted doubles e.g. $6+8$ seen as double 7

Strong commutativity – identical strategies always used.

How do children become fluent?

Children need to be **taught** strategies to derive the facts. Teaching strategies is more effective in securing fluency in addition and subtraction facts than taking a rote memorisation approach.

Suggested progression

Group A: Year 1 (Within 10)

1. Adding 1 (e.g. $7+1$ and $1+7$)
2. Doubles of numbers to 5 (e.g. $4+4$)
3. Adding 2 (e.g. $4+2$ and $2+4$)
4. Number bonds to 10 (e.g. $8+2$ and $2+8$)

5. Adding 10 to a number (e.g. $5 + 10$ and $10 + 5$)
6. Adding 0 to a number (e.g. $3 + 0$ and $0 + 3$)
7. The ones without a family! $5 + 3$, $3 + 5$, $6 + 3$, $3 + 6$

Knowing these facts by the end of Year 1 will mean children will know 87 of the 121 addition facts in the grid.

Group B: Year 2 (Bridging 10)

Children have 34 addition facts left to learn - they are the ones which bridge 10. While a few adults have instant recall of all of these, most rely on strategies for some. Our aim for children is that they use known facts or derived fact strategies to quickly recall or derive each fact. We need to ensure that all children move beyond counting based strategies. This will require careful teaching of the strategies combined with plenty of practice.

8. Doubles of numbers to 10 (e.g. $7 + 7$)
9. Near doubles (e.g. $5 + 6$ and $6 + 5$)
10. Bridging (e.g. $8 + 4$ and $4 + 8$)
11. Compensating

Note that these 3 strategies can often be used interchangeably, e.g. for $8 + 9$, some people will use near doubles (e.g. $8 + 8 + 1$), some will use bridging (e.g. $8 + 2 + 7$) and some will use compensating ($8 + 10 - 1$)

N.B. Before the children are ready to learn bridging as a strategy, they need to be able to partition all single digit numbers, therefore the following facts need to be taught alongside the above facts:

- Partitioning 2, 3, 4, 5, 6 and 10
- Partitioning 7, 8 and 9
- Partitioning 11 – 20 into single digit addends

Once children have been taught the strategies, they need to move on to **PRACTICE** of the facts, The aim is for an average of 3 seconds or less per fact.

Generally for practice

- We focus on practising the set of facts being learnt (or just learnt) in isolation for a few days
- We focus on mixing these up with all previously learnt facts

For each of these 11 steps, a suggested teaching approach is laid out below, including manipulatives/images, key teaching points and a suggested teaching progression.

Step 1: Adding 1 to a number

Images/manipulatives

A numbered number line



Numicon pieces



Key teaching points

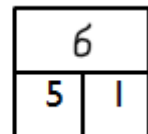
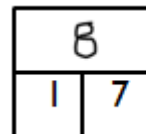
1st key point: Adding 1 to a number is the same as '1 more than' that number

2nd key point: Commutativity $7 + 1 = 1 + 7$

Teaching progression:

Concrete: Use equipment and a numbered number line to be able to say what is 1 more than any number to 10.

Pictorial: Represent this knowledge in part-part-whole diagrams



Abstract: Record this knowledge using number sentences;

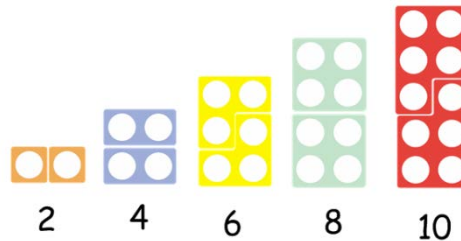
Model that these can be expressed **commutatively** $1 + 7 = 8$ or $7 + 1 = 8$

Model that these can also be expressed as **partitioning** the whole $8 = 1 + 7$ or $8 = 7 + 1$

Step 2: Doubles of numbers to 5

Images/manipulatives

Numicon pieces



$$1 + 1 = 2$$

$$2 + 2 = 4$$

$$3 + 3 = 6$$

$$4 + 4 = 8$$

$$5 + 5 = 10$$

Doubles written up

Key teaching points

1st key point: Our doubles of numbers to 5 are all even numbers [as appropriate you can lead children to the idea that doubling a whole number always gives us an even number]

2nd key point: We need to learn our doubles off by heart!

Teaching progression:

Awareness of odd and even: Be able to identify numbers as odd or even, using Numicon as a visual image

Fluency in odds and evens counting: Practice counting in even numbers

Understanding of what doubles is: “Double 5” = “Two lots of 5” [spoken] = $5 + 5$. Can the children show you these with Numicon pieces or fingers on each hand?

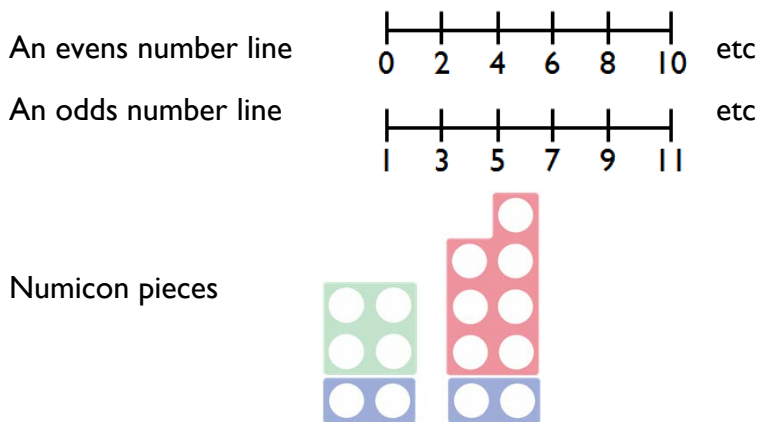
Noticing patterns: Look as a class at the doubles pattern and relate to even numbers

PRACTICE: Now you need to play LOTS of doubles games until the children all know their doubles of numbers to 5 off by heart. This is one of the sets which the children just need to memorise.

Represent in part-part whole models and in number sentences.

Step 3: Adding 2 to a number

Images/manipulatives



Key teaching points

1st key point: When we add 2 to a number, we are working within our odds and evens counting pattern

2nd key point: Commutativity $7 + 2 = 2 + 7$

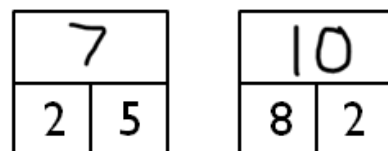
Possible teaching progression:

Awareness of odd and even: Be able to identify numbers as odd or even, using Numicon as a visual image

Fluency in odds and evens counting: Practice counting in odds and evens to 20, forwards and backwards until fluent. Use odd and even number lines for support.

Concrete: Use Numicon to see that when we add 2 to a number (or when we add a number to 2) we are just making the next odd/even number.

Pictorial: Represent this knowledge in part-part-whole diagrams

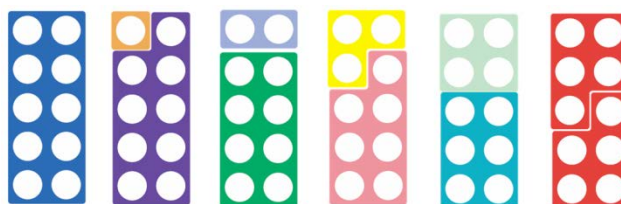


Abstract: Record this knowledge using number sentences; Model that these can be expressed commutatively and by partitioning the whole

Step 4: Number bonds to 10

Images/manipulatives

Numicon pieces



Number bonds to 10 written up

$$0 + 10 = 10$$

$$10 + 0 = 10$$

$$1 + 9 = 10$$

$$9 + 1 = 10$$

$$2 + 8 = 10$$

$$8 + 2 = 10$$

$$3 + 7 = 10$$

$$7 + 3 = 10$$

$$4 + 6 = 10$$

$$6 + 4 = 10$$

$$5 + 5 = 10$$

Key teaching points

1st key point: Our number bonds to 10 are always odd + odd OR even + even

2nd key point: Commutativity $6 + 4 = 4 + 6$

3rd key point: We need to learn our number bonds to 10 off by heart!

Teaching progression:

Awareness of odd and even: Be able to identify numbers as odd or even, using Numicon as a visual image

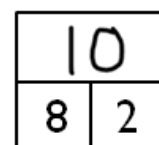
Exploring different ways of making up 10: Using the Numicon for support, notice that the number bonds to 10 are always odd + odd or even + even

PRACTICE: Now you need to play LOTS of games until the children all know their number bonds to 10 off by heart. This is one of the sets which the children just need to memorise.

Represent in part-part whole models and in number sentences.

Pictorial: Represent this knowledge in part-part-whole diagrams

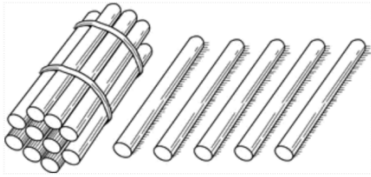
Abstract: Record this knowledge using number sentences; Model that can be expressed commutatively and by partitioning the whole



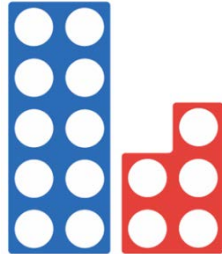
these

Step 5: Adding 10 to a number

Images/manipulatives



Base ten, e.g. straws, numicon



Key teaching points

1st key point: When we add 10 to a number we can use our place value knowledge to combine the numbers

2nd key point: Commutativity $10 + 5 = 5 + 10$

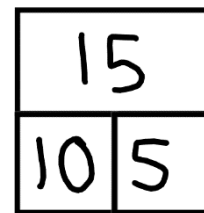
Teaching progression:

Place value experience: Make up 'teens' numbers with place value equipment e.g. straws (or Numicon/Dienes).

Relate place value representation to notation: *"This is the number fifteen. We write it 15 because there is one ten and five ones."*

Pictorial: Represent this knowledge in part-part-whole diagrams

Abstract: Record this knowledge using number sentences; these can be expressed commutatively and by partitioning the



Model that whole

Step 6: Adding 0 to a number

Images/manipulatives

Counters/straws/Numicon would all do here.

Key teaching points

1st key point: When we add 0 to a number we are adding nothing, and so our starting number remains the same. [Misconception here is that $7 + 0 = 0$]

2nd key point: Commutativity $0 + 4 = 4 + 0$

Teaching progression:

Practical experience of making up number sentences involving 0: Show me 0. Now add 4. How much do you have? Show me 4. Now add 0. How much do you have?

Stem sentence: “When we add 0, we don’t change the quantity.”

Pictorial: Represent this knowledge in part-part-whole diagrams

Abstract: Record this knowledge using number sentences; Model that these can be expressed commutatively and by partitioning the whole

Step 7: The ones without a family

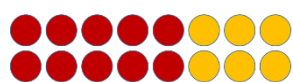
The only remaining Y1 facts are $6 + 3$ & $3 + 6$ and $3 + 5$ & $5 + 3$. These just need to be learnt. Fluent children often relate $6 + 3$ to the counting in 3s pattern.

For $5 + 3$ and $3 + 5$ (indeed for any addition fact involving 5) children can be taught to recognise the standard “finger pattern” for 8 of 5 fingers and 3 fingers fairly easily, then this can be related to $5 + 3$ and vice versa (incidentally it is worth getting all reception children to recognise 6, 7, 8, and 9 when presented in this way, then they already ‘know’ $5 + 1$, $5 + 2$, and $5 + 4$ as well (they just need to be *taught* that they already know them!).



Step 8: Double 6, 7, 8 and 9

Images/manipulatives



Double sided counters can model double 6, 7, 8 and 9 as double “5 and a

bit” (i.e. double 8 is double 5 add double 3)



Numicon will allow the children to see that doubles of whole numbers are always even numbers

Key teaching points

1st key point: Doubles of whole numbers are always even

2nd key point: We need to learn our doubles off by heart!

Teaching progression:

[From Y1, children should be able to identify even numbers and know that a double means two lots of]

Teach as follows:

Double 6: use the clock face. 6 at the bottom, 12 at the top.

Double 7: explain that two weeks is called a fortnight because it has 14 nights. There are 7 days in a week, so double 7 is 14.

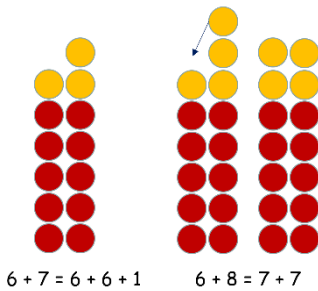
Double 8 & double 9: for a few children, remembering which is 16 and which is 18 seems particularly hard. There isn't any substitute for practice here. Keep asking any target children this many times each day for a week, and keep a record of which children don't yet know it.

Relating to inverse. What is half of 14 etc.

Once the facts are learnt, represent in part-part whole and equations as before.

Step 9: Near doubles

Images/manipulatives



Adjacent numbers well recognised as being 'near doubles' but 'one up one down' (i.e. second model shown here) is also a really nice efficient use of doubling.

Key teaching points

1st key point: I can add adjacent numbers by doing 'double and 1 more'

2nd key point: I can add number with a difference of 2 (e.g. $6 + 8$) by doubling the number in between them (i.e. by doubling 7 in this case)

3rd key point: Commutativity: $5 + 6 = 6 + 5$

Teaching progression:

Fluency in doubles: Will already have been secured

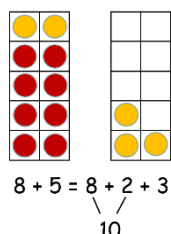
Adjacent numbers: Will be double the smaller number, add 1. OR double the larger number, subtract 1.

Difference of 2: $5 + 7$, $6 + 8$, $7 + 9$

Then part-part whole and practice with equations as before

Step 10: Bridging

Images/manipulatives



Tens frames

Key teaching points

1st key point: Bridging through ten can help us to calculate additions with a 'teens' total

2nd key point: Commutativity: $5 + 8 = 8 + 5$

Teaching progression:

Partitioning single digit numbers: Children HAVE to be able to do this to bridge. Calculating e.g. $8 + 5$ by bridging requires partitioning the 5 into 2 and 3

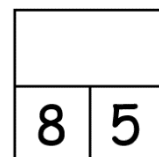
What makes ten?: Children need to be able to make ten from 7, 8 and 9 (which are most likely to be involved in bridging facts)

Tens frames (concrete): Make up the two quantities with counters on adjacent tens frames, then rearrange as shown above.

Symbolic: Practice recording as number sentences (as shown above)

Part-Part Whole: Move to filling in PPW as shown here:

Number sentences (Abstract): Children in the end should be able $8 + 5$ (etc) presented as number sentences by thinking " $8 + 2 + 3$ " in heads



to solve
their

Comparison to other strategies: Highlight that we can also use e.g. near doubles to solve some bridging facts (e.g. $8 + 7$)

Step 11: Compensating/adjusting

Images/manipulatives

The children should already be fluent in e.g. $5 + 10$ and $10 + 5$

$$5 + 10 = 15 \quad \text{so}$$

$$5 + 9 = 14$$

Key teaching points

1st key point: By subtracting one from 'add ten' I get 'add nine'

2nd key point: Commutativity ($5 + 9 = 9 + 5$)

Teaching progression

Fluency in adding ten: will already have been secured

Then PPW and practice with number sentences as before

Adding 8 and 7: Highlighting possibility of using compensating for adding numbers other than 9 (e.g. 8 and 7)

Comparison to other strategies: Highlight that we can also use near doubles and bridging to solve some compensating facts, e.g. $8 + 9$

2. Developing fluency in multiplication and division facts

Being able to recall multiplication tables with fluency plays a crucial role in children being able to solve more complex mathematical problems involving division, algebra, fractions and proportional reasoning. In order to be fluent children must be able to recall the answers to multiplication questions within 5 seconds. By the end of Year Four children should be secure with all multiplication facts up to 12×12 .

Rationale

- Mental recall and understanding of multiplication and division facts is an area for development in year groups. Multiplication and division facts are a separate strand in the new curriculum and present challenging targets for our children. This needs to be addressed and will be done in a fun, engaging way.

Maths Badges

At Bowlee Park multiplication and division facts have been grouped together, sometimes with other number facts, to form the following maths badges.

- This is a school approach, running from Year 1 to Year 6. The aim is to ensure that children are completely secure at rapidly recalling facts to retain and use in further problems and application.

Yellow	Green	Red	Blue	Purple	Bronze	Silver	Gold	Diamond	Platinum	Emerald	Ruby	Sapphire	Maths Cap
I know number bonds to 5.	I know the number bonds to 10.	I know the number bonds to 15.	I know the number bonds to 20.	I know my multiplication and division facts for 2, 5, and 10 times tables.	I know my multiplication and division facts for 3, and 4 times tables.	I know my multiplication and division facts for 8 and 11 times tables. I know the double for numbers 1 to 25 and can halve all even numbers to 50.	I know my multiplication and division facts for 6 and 12 times tables.	I know multiplication and division facts for 9 and 7 times tables. I know doubles and halves of all numbers to 100.	I know the first 19 prime numbers. I can read numbers to 1 million (including decimal numbers up to 3dp) and identify the value of each digit. I know square numbers up to 20×20 .	I know the first 10 cube numbers. I know doubles and halves for numbers to 1000. I can multiply whole numbers by 10, 100 and 1000.	I know decimal number bonds (2dp). I can round decimal number (3dp). I can multiply and divide a decimal number (3dp) by 10, 100 and 1000.	I know equivalent FDP. I can calculate fractions/percentages of amounts. I can apply my knowledge of timetables to multiply decimal numbers.	I can verbally recall all of the maths badge facts with fluency. I have a secure understanding of all the key mathematical vocabulary e.g. product, quotient.

The maths badges are progressive and should be achieved in certain year groups. (Please see pages 17-23 for end of year expectations for each year group).

Children will be tested regularly on their times tables to ensure rapid recall of multiplication facts. Children will be provided with a maths badge test and given an allotted time to answer the questions. Once children have passed their assessment they will receive their badge or maths cap. Once children have achieved their maths cap they will be considered a 'Maths Champion'.

The following pages set out the end of year expectations in Number for each year group from Reception to Year 6. In order to be fluent in number children need to meet the end of year expectations for their year.

The highlighted statements show in which year groups children are expected to achieve their number bonds and maths badges.

Number facts – End of Year expectation **Reception**

Number – ELG

Children at the expected level of development will:

- Have a deep understanding of number to 10, including composition of each number;
- Subitise (recognise quantities without counting) up to 5;
- Automatically recall (without reference to rhymes, counting or other aids) number bonds up to 5 (including subtraction facts) and some number bonds to 10, including doubling facts. *

Numerical Patterns – ELG

Children at the expected level of development will:

- Verbally count beyond 20, recognising the pattern of the counting system;
- Compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as the other quantity;
- Explore and represent patterns with numbers to 10, including evens and odds, double facts and how quantities can be easily distributed.

* Therefore, children at the expected level of development will have achieved their yellow maths badge and will be working towards achieving their green.

Number facts – End of Year expectation **Year 1**

<u>Counting and Place value</u> • Count to and across 100 (forwards and backwards from any given number). • Count in steps of 2 (forwards and backwards) • Count in steps of 5 (forwards and backwards). • Say one more and one less from a given number. • Read and write numerals to 20 (numerals and words)	<u>Multiplication and division</u> • (Counting in 2s, 5s and 10s).
<u>Number bonds</u> • Number bonds to 5- Yellow • Number bonds to 10.- Green (Know all addition and subtraction facts for all numbers between 0 and 10).	<u>Doubling and Halving</u> • Know all doubles to 10. • Know all halves to 10.
<u>Addition and Subtraction</u> • Add a one digit number to a two-digit number to 20. • Subtract a one digit number from a two-digit number to 20. • Add numbers to 20. • Subtract numbers to 20. • Solve missing number calculations. • Understand the effect of adding and subtracting 0.	

Number facts – End of Year expectation **Year 2**

<u>Counting and Place value</u> - Count forwards and backwards in 10s from any given number. - Count forwards and backwards in 2s from any given number.	<u>Multiplication and division</u> - X2 - X5 - X10 - Division facts for x2 - Division facts for x5 - Division facts for x10 Purple (2,5,10)
<u>Number bonds</u> - Number bonds to 15- Red - Number bonds to 20 - Blue (If children are not secure on number bonds to 20 by end of Spring 1 they must move in to times tables).	<u>Doubling and Halving</u> - Know the doubles of all numbers to 20. - Know the halves of all numbers to 20.
<u>Addition and Subtraction</u> - Add multiples of 10. - Subtract multiples of 10. - Know all addition facts for multiples of 10 to 100. - Know all subtraction facts for multiples of 10 to 100.	

Number facts – End of Year expectation **Year 3**

<u>Counting and Place value</u> - Count from 0 in multiples of 100. - Count from 0 in multiples of 50. - Count from 0 in multiples of 8. - Count forwards and backwards in 4s from any given number. - Count forwards and backwards from any given number in 3s. - Find 10 more/ less than a given number. - Find 100 more/less than a given number. - Understand the values of H,T and ones. - Read and write numbers to 1000 (Numerals and words).	<u>Multiplication and division</u> - X4 - X3 - X8 - Division facts for x4 - Division facts for x3 - Division facts for x8 - X11 - Division facts for 11
<u>Number bonds</u> Number bonds to 100.	<u>Doubling and Halving</u> - Know doubles of all multiples of 10 to 500. - Know halves of all multiples of 10 to 500. - Know doubles of all multiples of 100 to 5000. - Know halves of all multiples of 100 to 5000.
<u>Addition and Subtraction</u> - Know all addition and subtraction facts for multiples of 100 to 1000. - Know all addition and subtraction facts for multiples of 5 with a total of 100. - Add and subtract mentally: - A three-digit number and ones - A three-digit number and tens. - A three0digit number and hundreds.	

Bronze

- X3
- X4
- X8

Silver

- X11
- Doubles 1-25
- Halves of all even numbers to 50.

Number facts – End of Year expectation **Year 4**

<u>Counting and Place value</u> - Count from 0 in multiples of 25 and 1000. - Count from 0 in multiples of 6,9,7,11 and 12. - Understand the value of Th, H, T and Ones. - Find 1000 more/less than a given number. - Count backwards through 0 to include negative numbers.	<u>Multiplication and division</u> - X6 - X12 - X9 - X7 - Division facts for x6 - Division facts for x12 - Division facts for x9 - Division facts to x7 (All multiplication facts up to 12x12 should be known by the end of Y4)
<u>Number bonds</u> - Recognise and use factor pairs and commutativity in mental calculations. - Know all pairs of multiples of 50 with a total of 1000.	<u>Doubling and Halving</u> - Know doubles and halves of all whole numbers to 100. - Know doubles and halves of all multiples of 5 to 1000. - Know all doubles and halves of all multiples of 50 to 5000.
<u>Addition and Subtraction</u> - Add and subtract pairs of two digit numbers. - Add and subtract 9/19/29 etc. to two digit numbers. - Add and subtract 11/21/31 etc. to two digit numbers.	

<u>Gold</u>	<u>Diamond</u>
- X6 - X12	- X9 - X7 - Doubles and halves to 100 – all numbers

• Number facts – End of Year expectation **Year 5**

<u>Counting and Place value</u> - Counting forwards and backwards from any given number, in any steps, crossing boundaries and into negative numbers. - Count forwards and backwards in steps of powers of 10 for any given number up to 1 000 000. - Count forwards and backwards through 0 with positive and negative numbers. - Understand the value of HTH, TTH, Th, H, T and Ones.	<u>Multiplication and division</u> - Continue to rehearse all multiplication tables up to 12x12 and division facts. - Recognise all prime numbers up to 19. - Recognise and use square numbers and cube numbers and the notation or squared and cubed.
<u>Number bonds</u> - Recognise and use factor pairs and commutativity in mental calculations. - Know all pairs of multiples of 50 with a total of 1000.	<u>Doubling and Halving</u> - Know doubles and halves of all whole numbers to 50. - Know doubles and halves of all multiples of 5 to 1000. - Know all doubles and halves of all multiples of 50 to 5000.
<u>Addition and Subtraction</u> - Add and subtract pairs of two digit numbers. - Add and subtract 9/19/29 etc. to two digit numbers. - Add and subtract 11/21/31 etc. to two digit numbers.	

Platinum	Emerald	Ruby
First 19 cube numbers	First 10 cube numbers	Decimal number bonds (2dp)
Square numbers 20x20	Doubles and halves to 1000	Round decimal numbers to 3dp
Read/understand place value to 1 million (including 3dp)	Multiply whole numbers by 10, 100, 1000	Multiply and divide decimal numbers (3dp) by 10, 100, 1000

Number facts – End of Year expectation **Year 6**

<u>Counting and Place value</u> - Counting forwards and backwards from any given number, in any steps, crossing boundaries and into negative numbers. - Know the decimal and percentage equivalents of the fractions $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{3}$, $\frac{2}{3}$, tenths and fifths. - Calculate mentally using brackets. - Understand the value of M, HTh, TTh, Th, H, T and Ones.	<u>Multiplication and division</u> - Continue to rehearse all multiplication tables up to 12x12 and division facts. - Know all square roots to 20x20. - Know all prime numbers within 50. - Cube numbers to 10 x 10 x 10
<u>Number bonds</u> - Recognise and use factor pairs and commutativity in mental calculations. - Know all pairs of multiples of 50 with a total of 1000.	<u>Doubling and Halving</u> - Know doubles and halves of one digit decimals. - Know doubles and halves of two digit decimals. - Know the doubles and halves of all multiples of 10 to 10,000. - Know the doubles and halves of all multiples of 1000 to 100,000.
<u>Addition and Subtraction</u> Perform mental calculations, including with mixed operations and large numbers.	

Sapphire	Maths Cap
Equivalent FDP. Calculate fractions/percentages of amounts Multiplication facts up to 20x20	Secure and fluent verbal recall all of the maths badge facts Secure understanding of all the key mathematical vocabulary e.g. product, quotient,