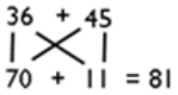
Royston St Johns Primary School Mental Maths

	Y1	Y2	Y3	Y4	Y5	Y6
Counting (Forwards and backwards)	0-100, starting on any numbers	Count in 2, 5, 10 and 3 (including odd and even)	Count in 4 and 8	Count in 6, 7 and 9	Count in powers of 10 from any number up to 1,000,000	Consolidating
		Count in 10, starting with any number (within 100)	Count in 50	Count in 25		
	Count in 2, 5 and 10 (including odd and even)		Count in 100, starting with any number (within 1000)	Count in 1000, starting with any number	Count to -100, starting with any number	
				Count to -20, starting with any number		
Reading/Writing Numbers	To 100, in numerals To 20, in words	To 100, in numerals and words	To 1,000, in numerals and words	To 10,000, in numerals and words	To 1,000,000, in numerals and words	To 10,000,000 in numerals and words
Times Tables		2, 5, 10	2, 5, 10, 3, 4, 8	Up to 12 x 12, including 0 & 1	Consolidating	Consolidating
Number Bonds	To 10	To 20	To 100	To 1000 (multiples of 10)	Decimals to 10 (1dp)	Decimals to 10 (2dp)
		To 100 (multiples of 10)	To 1000 (multiples of 100)	Decimals to 1 (1dp)	Decimals to 1 (2dp)	
Addition & Subtraction	1 more/less than 2-digit numbers	1 or 10 more/less than 2-digit numbers	1, 10 or 100 more/less than 3-digit numbers	1, 10, 100 or 1,000 more/less than 4-digit numbers	Powers of 10 more/less to 100,000 e.g. 12,462 – 2,300	Powers of 10 more/less to 1,000,000 e.g. 237,851 – 5,400
	To 5 + 5, including varied composition 5 + 0 = 5 0 + 5 = 5 4 + 1 = 5 1 + 4 = 5 3 + 2 = 5 2 + 3 = 5	To 10 + 10, including varied composition	Consolidate key facts to 20	2-digit + 2-digit (bridging 10 **and** 100)	3-digit + 3-digit (bridging 10, 100 **or** 1000)	3-digit + 3-digit (bridging 10, 100 **and** 1000)
		Three 1-digit numbers, e.g. 9 + 4 + 5 = 9 + 9 = 18	2-digit + 2-digit (bridging 10 **or** 100)	Adding 3-digit numbers (multiples of 10, bridging 10 **or** 1000)	Adding 3-digit numbers (multiples of 10, bridging 10 **and** 1000)	Adding 4-digit numbers (multiples of 10)
	One-digit and two-digit numbers to 20, including zero	Multiples of 10 (within 100)				
Multiplication & Division			Teen numbers by 2, 5, 3, 4 or 8 (e.g. 17 x 4 = 40 + 28 = 68)	2-digit by 1-digit (e.g. 46 x 8 = 320 + 48 = 368)	3-digit by 1-digit (e.g. 346 x 8 = 2400 + 320 + 48 = 2768)	Consolidating
			Multiples of 10 by 2, 5, 3, 4 or 8 (e.g. 4 x 60)	Multiples of 10 and 100 (e.g. 80 x 70, 900 x 6)	Powers of 10 to 1,000,000	Powers of 10 to 10,000,000
			Simple three one-digit numbers (e.g. 5 x 4 x 9 = 20 x 9 = 180)	Three one-digit numbers (e.g. 7 x 2 x 9 = 14 x 9 = 90 + 36 = 126)	Decimals (1dp) (e.g. 1.4 x 8 = 8 + 3.2 = 11.2)	Decimals (2dp) (e.g. 2.38 x 4 = 8 + 1.2 + 0.32 = 9.52)
Double & Halve	Doubles up to 5 + 5	Doubles up to 10 + 10, double 25 and 50	Doubles up to 50 + 50, double multiples of 100	Doubles to 100 + 100, double multiples of 1000	Doubles and halves to 500 and multiples of 100 to 10,000	Doubles and halves to 1,000 and multiples of 100/1000 to 100,000
	Halve even numbers up to 10	Halve even numbers up to 20	Halve even numbers up to 50	Halve even numbers to 100/odd numbers to 20	Halve of decimals (1dp)	Halve of decimals (2dp)

Developing Fluency in Addition and Subtraction Facts

Why the focus on fluency in addition and subtraction facts?

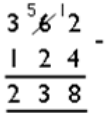
- A defined set of addition and subtraction facts built the basis of all additive calculation, just as times tables are the building blocks for all multiplicative calculation:



Informal/mental addition by partitioning:

Root addition facts

3 + 4, 6 + 5



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.
- Children need to be taught strategies to solve these facts. Most children don't magically become fluent in these facts even in KS2, particularly for those which bridge 10. If they 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 get stuck on inefficient counting based approaches.

Does fluency just mean memorisation?

Not necessarily – some number facts are memorised and can be recalled instantly whereas fluency generally means 'getting an answer pretty quickly and with limited demands on working memory', usually within 3 seconds. KS2 who were working at this speed showed:

- Most facts which didn't bridge 10 were memorised – the children reported 'just knowing' than 4 + 5 = 9 or 2 + 6 = 8 for example
- Double 6, 7. 8 and 9 were always memorised in fluent children
- For facts which bridge 10, the picture is more complex and many of the facts which bridge 10 were quickly derived using strategies (but still in less than 3 seconds!) For example, 9 + 8 is a fact that actually very few people (either adults or children) have memorised. Most fluent people solve this through very quickly applying a strategy: bridging, near doubles or compensating.

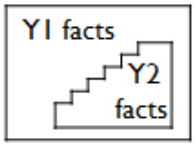
	0	1	2	3	4	5	6	7	8	9	10
0	K	K	K	K	K	K	K	K	K	K	K
1	K	K	K	K	K	K	K	K	K	K	K
2	K	K	K	K	K	K	K	K	K	K	K
3	K	K	K	K	K	K	K	K	S	S	K
4	K	K	K	K	K	K	K	S	K	S	K
5	K	K	K	K	K	K	S	S	S	S	K
6	K	K	K	K	K	S	K	S	S	S	K
7	K	K	K	K	S	S	S	K	S	S	K
8	K	K	K	S	K	S	S	S	K	S	K
9	K	K	K	S	S	S	S	S	S	K	K
10	K	K	K	K	K	K	K	K	K	K	K

The grid shows the approaches taken by a fluent, high attaining Year 4 child to each of the addition facts.

(K= Known fact/memorised; S= Strategy/fluent)

What facts do children need to be fluent in?

+	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



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.)

-	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

The majority of these facts will be learnt in Years 1 & 2. Year 3 will need to focus on securing fluency in addition and subtraction facts which bridge 10. Although this is a Year 2 objective, real fluency in subtraction facts such as 14 – 9 and 13 – 5 (where fluency is an answer in 3 seconds) for each and every child in Y2 is unrealistic. Unless we are honest about that and accept the need to secure this in Year 3, we risk having children who never become secure in this.

In reception, children become fluent in working with totals to 5 (though not recording as number sentences), e.g. "Show me 5 on your hands. Now show me 5 in a different way."

How do children become fluent?

As mentioned above, children need to be **TAUGHT** strategies to derive the facts! Research shows that teaching strategies is more effective in securing fluency in addition and subtraction facts than taking a rote memorisation approach. That is to say, although the aim is memorisation, the most effective way to get there is through the teaching of strategies. For example , for children to know that 4 + 2 = 6 or 9 – 2 = 7 they need to be taught that when we add 2 or subtract 2 we are moving to the next/previous even number (if starting on an even) or odd number (if starting on an odd). Without being taught this, many children will count, e.g. nine, eight, **seven**.

+	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

Adding 1 | Bonds to 10 | Adding 10 | Bridging/ compensating

Adding 2 | Adding 0 | Doubles | Near doubles

N.B. Before the children are ready to learn bridging as a strategy, they need to be able to partition all single digit numbers.

Once children have been taught the strategies, they need to move on to **PRACTICE** the facts. The aim of the practice is increasing speed and fluency (less than 3 seconds) in the applied strategy, and then ultimately, memorisation. This means that in 2 minute practice session children should be recalling at least 40 facts! Focus on practising the set of facts being learnt (or just learnt) in isolation for a few days and then try mixing these up with all previously learnt facts. Practice them in any spare minutes (e.g. lining up for assembly, coming in after break) using flash cards. Review the strategy for each one too, e.g. 'That's right, double 6 add 1' after looking at 6 + 7.

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. Near doubles (e.g. 3 + 4 *and* 4 + 3)
8. The ones without a family! 5 + 3, 3 + 5, 6 + 3, 3 + 6

Group B: Year 2 (Bridging 10)

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