



Fluency Policy

In God's love, aspire and achieve to be the best'
1 Corinthians 16:14 'Do everything in love.'

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

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 built 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

$$\begin{array}{r} 3 \overset{5}{\cancel{6}} 2 \\ - 124 \\ \hline 238 \end{array}$$

Formal subtraction with column method

Root subtraction facts

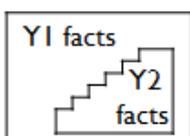
- If child's working memory is taken up by calculating basic facts, and children have less working memory to focus on solving the actual problem so fluency in basic facts allows children to tackle more complex maths more effectively.
- Fluency is one of the 3 aims of the national curriculum, and external test 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?

The full set of addition facts is here and corresponding subtraction 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

-	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
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



Note that in subtraction facts 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 number sentences), 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 didn’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 were 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	Name	MS				
1	K	K	K	K	K	K	K	K	K	K	K	School	AD				
2	K	K	K	K	K	K	K	K	K	K	K	Year	4				
3	K	K	K	K	K	K	K	K	S	S	K	Level	3a				
4	K	K	K	K	K	K	S	S	K	S	K						
5	K	K	K	K	K	S	S	S	S	S	K						
6	K	K	K	K	S	S	K	S	S	S	K	Notes on strats					
7	K	K	K	S	S	S	K	S	S	S	K	Predominantly bridging					
8	K	K	S	K	S	S	S	K	S	S	K	Diff of 2 converted to doubles e.g. $6+8$ saw as double 7					
9	K	K	S	S	S	S	S	S	S	K	K	Strong commutativity - identical strats always used					
10	K	K	K	K	K	K	K	K	K	K	K						

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

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 0 to a number (e.g. $3 + 0$ and $0 + 3$)
6. Adding 10 to a number (e.g. $5 + 10$ and $10 + 5$)
7. The ones without a family! $5 + 3$, $3 + 5$, $6 + 3$, $3 + 6$ (these last two can be related to counting in 3s)
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 ($8 + 10 - 1$)

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** 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

2. Rationale: Sum Dog and Times Table Rockstars (TTRS)

- 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.
- 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.

How it works

Sum Dog: Sumdog, a game based learning tool, provides engaging adaptive learning for maths. It is used from Year 1-Year 6 to practise, challenge and support key fluency skills, including multiplication/ division practise

It adapts questions for each individual and is fully aligned to the National Curriculum. It assists in diminishing the difference - by helping every pupil reach their full potential. Sumdog's learning engine ensures that all pupils work at the level and pace that is right for them, and won't move them onto new skills before they are ready. Pupils of all levels can compete against each other as each will receive a tailored set of questions.

It is used weekly in classroom practise and set at least twice a half term as homework (local and national contests).

TTRS:

Times Tables Rock Stars is a carefully sequenced programme of times tables practice. Each session concentrates on a different times table, with consolidation for rehearsing the tables that have recently been practised every third session or so. Times table recall speed is fundamental to later success in maths lessons. Teachers select which times tables they will practice each week. Pupils can compete against others

from around the world in live games (Rock Festival mode) and can play against all their classmates (Rock Arena mode).

It is used weekly in classroom practise and set as a weekly homework option.