



## How to help your child... add and subtract quickly

### Why we focus on fluency in addition and subtraction facts

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

$\begin{array}{r} 36 + 45 \\   \times   \\ 70 + 11 = 81 \end{array}$	$\begin{array}{r} 3^5 6^1 2 \\ 124 \\ \underline{238} \end{array}$
Informal addition by partitioning:	Formal subtraction with column method
Root addition facts	Root subtraction facts
3+4, 6+5, 7+1, 0+1	12-4, 5-2, 3-1

calculation. For example:

- 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 (see [Is It True That Some People Just Can't Do Math?](#) by the cognitive scientist Daniel Willingham). So fluency in basic facts allows children to tackle more complex maths more effectively.
- The importance of fluency is recognised in the national curriculum, and since 2016, children's fluency is more heavily tested by SATs.
- 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 facts 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 using 'find the difference' strategies, then many children will get stuck on inefficient counting based approaches.

- Counting on approaches are not only less efficient, they are associated with lower attainment in maths as well. Research by Tall and Gray (1994) found higher attainers tend to use known facts or derived fact strategies, and lower attainers are much more likely to use counting based approaches to solve addition and subtraction facts.

### Does fluency just mean memorisation?

Not necessarily – when you ask adults how they solve addition and subtraction facts, almost all adults rely on very quick use of strategies to solve some of them. Reflect carefully on the set of addition and subtraction facts shown over: which have you memorised and which are you very quickly deriving? We've taken fluency to mean 'getting an answer pretty quickly and with limited demands on working memory', aiming for an average of three seconds or less per fact.

### How do children become fluent?

Children need to be **TAUGHT** strategies to derive the facts!

In Year 1 we teach strategies for facts within 10 (steps 1 – 7) and in Year 2 we teach the bridging ten facts (steps 8 – 11).

- Adding 1 (e.g. 7 + 1 and 1 + 7)
- Doubles and near double of numbers to 5 (e.g. 3 + 3, 4 + 5, 5 + 4)
- Adding 2 (e.g. 4 + 2 and 2 + 4)
- Number bonds to 10 (e.g. 8 + 2 and 2 + 8)
- Adding 0 to a number (e.g. 3 + 0 and 0 + 3)
- Adding 10 to a number (e.g. 5 + 10 and 10 + 5)
- The ones without a family 5 + 3, 3 + 5, 6 + 3, 3 + 6 (these pairs of facts are the only ones which don't fit in any of the other families, though the last two can be related to counting in 3s)

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

The last three of these 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).

NB: before the children are ready to learn bridging as a strategy, they need to be able to partition all single digit numbers. Adding 8 + 5, for example, by bridging through ten requires children to partition 5 into 2 and 3. We do an enormous amount on partitioning single digit numbers all through Year 1.

Once children have been taught the strategies, they need to move on to **PRACTICE** of the facts, Remember, for many facts the ultimate aim of the practice is memorisation, while for others the aim of the practice is increasing speed and fluency in the applied strategy.

Generally, for practice focus on:

- Practising the set of facts being learnt (or just learnt) in isolation for a few days
- Mixing these up with all previously learnt facts.

Although working on securing fluency in addition and subtraction facts might sound basic and dry, we have found children really enjoy both the discussion and reasoning that the learning of strategies involves, and the confidence they get from having these building blocks in place.

They feel so much more confident in their maths if they have strategies for 9+6 which don't rely on the inefficient and error-prone method of 'putting 9 in your head and counting on...".

*(With thanks to the NCETM for their advice on teaching addition facts).*

Adding 1

Bonds to 10

Adding 10

Bridging/  
compensating

Y1 facts

Adding 2

Adding 0

Doubles

Near doubles

Y2  
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