Easy Addition and Subtraction

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1 Rationale

Why am I suggesting a new method for addition and subtraction? This new method allows a student to learn to add and subtract many digit numbers using less memory. You can see if this method helps your students and let me know if it does.

2 Method

I have little time, so I will introduce the method by example. I hope you can follow. If you are in a hurry skip to section 3 where I explain the efficiency in terms of memorization. And here is a link to a working example, because if you practice out loud, you get very fast.
`https://youtube.com/shorts/qVWN7ww-wsw`

2.1 Addition Example

$$\begin{array}{r} 2\,.\,7\,9 \\ +\,3\,2\,.\,5\,1 \\ \hline \end{array}$$

step A:
$9 + 1 = 10$

$$\begin{array}{r} 2\,.\,7\,9 \\ +\,3\,2\,.\,5\,1 \\ \hline 0 \end{array}$$

step B:
$1 + 7 = 8$
$8 + 5 = 8 + 2 + 3 = 10 + 3 = 13$ $(8 + 2$ because $8 + 2 = 10)$

$$\begin{array}{r} 2\ .\ 7\ 9 \\ +\ 3\ 2\ .\ 5\ 1 \\ \hline 3\ 0 \end{array}$$

step C:
$1 + 2 = 3$
$3 + 2 = 5$

$$\begin{array}{r} 2\ .\ 7\ 9 \\ +\ 3\ 2\ .\ 5\ 1 \\ \hline 5\ .\ 3\ 0 \end{array}$$

step D:

$$\begin{array}{r} 2\ .\ 7\ 9 \\ +\ 3\ 2\ .\ 5\ 1 \\ \hline 3\ 5\ .\ 3\ 0 \end{array}$$

2.2 Subtraction Example

$$\begin{array}{r} 2\ 5\ .\ 2\ 5 \\ -\quad 6\ .\ 0\ 9 \\ \hline \end{array}$$

step A:
$9 = 5 + 4$
$10 - 4 = 6$

$$\begin{array}{r} 2\ 5\ .\ 2\ 5 \\ -\quad 6\ .\ 0\ 9 \\ \hline 6 \end{array}$$

step B:
$2 - 1 = 1$
$1 - 0 = 1$

$$\begin{array}{r} 2\ 5\ .\ 2\ 5 \\ -\quad 6\ .\ 0\ 9 \\ \hline 1\ 6 \end{array}$$

step C:

$6 = 5 + 1$
$10 - 1 = 9$

$$\begin{array}{r} 2\ 5\ .\ 2\ 5 \\ -\quad 6\ .\ 0\ 9 \\ \hline 9\ .\ 1\ 6 \end{array}$$

step D:
$2 - 1 = 1$

$$\begin{array}{r} 2\ 5\ .\ 2\ 5 \\ -\quad 6\ .\ 0\ 9 \\ \hline 1\ 9\ .\ 1\ 6 \end{array}$$

3 Proof of Efficiency

The reason that both these methods are efficient in terms of memorization is that there are less atoms to memorize. Here is the proof.

Typically a student may need to memorize $15-9$ for example. In our method you would only need $9-5 = 4$ and $10-4 = 6$. So in normal method they need to have everything from the set $A = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18\}$ and be able to subtract anything from the set $B = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$, such that $A > B$. That is 155 different subtraction results to memorize.

However in the new method, they need to be able to memorize everything from the set $A = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ and be able to subtract anything from the set $B = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$, such that $A > B$. That is 55 different subtraction results to memorize. As you can see, the new method is 3 times easier in terms of memory.