Andrell Education Ltd
Raising Standards in Education

Introduction

What are 'Column Methods'?

'Column Methods' are the traditional, compact algorithms for solving calculations using pencil and paper. 'Column Methods' is a generic title since for all 4 operations we move from column to column addressing each column one at a time.

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 3  16  13  1
 ~4  ~7  ~4  6
-  1  9  7  8
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   2  7  6  8
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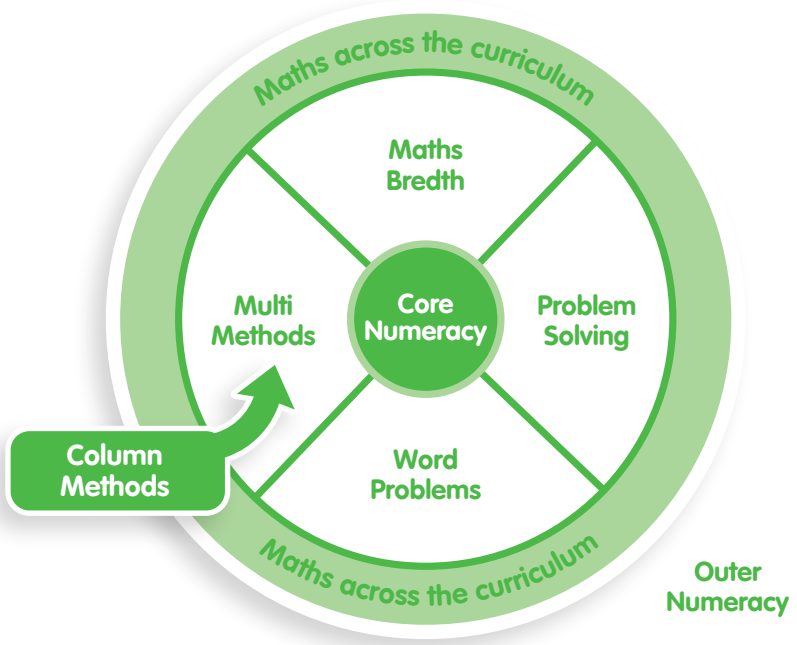
These traditional methods involve terminology such as 'carrying', 'borrowing', 'doorstep', 'bus-stop' etc. Here we look at steps of progression for such methods and how those steps relate to the steps found in the core numeracy of CLIC. Teachers may well vary the language and positioning of digits to suit their own preferences. The main focus here is how the steps and methods link to CLIC.

Why do we teach 'Column Methods'?

The starting point for Big Maths is to teach for understanding. Column Methods however are generally low on understanding but they are much more efficient than high-understanding written methods. Column Methods should be taught to complement the high-understanding methods of CLIC.

In Big Maths, Column Methods live in a part of 'outer numeracy' called 'multi-methods'. This is where we teach more efficient methods to already numerate children. We must be careful not to enter into a debate as to whether we should teach high-understanding methods or Column Methods. It is both! In Big Maths children master many high-understanding steps before they start to learn Column Methods so that the Column Methods don't mask, or cause, low levels of numeracy.

However, even when children have started learning Column Methods they continue to make progress up the high-understanding



Progress Drives from the calculation part of CLIC. This is crucially important because:

- it is the high-understanding steps that empower children to be properly numerate,
- in some cases the steps in the Calculation part of CLIC provide a direct explanation for what is happening in the column method procedure,
- these steps lead to progression in mental maths through use of the 'FAB continuum', whereas Column Methods do not.

When do I teach 'Column Methods'?

The steps of progression provided here can be taught as an isolated sequence of progression. It is recommended that they only begin after children have secured the high-understanding foundations from CLIC as follows:

- Addition: after Step 24
- Subtraction: after Step 27
- Multiplication: after Step 11
- Division: after Step 18

Schools may also wish to structure the progression of Column Methods by using the download document 'CLIC on Your Planning'. This describes which term to teach each step for the entire CLIC framework as well as for the column method steps provided here. It is available from **www.AndrellEducation.com.**

Key Message

Following on from these steps children start a sequence of progression for written Column Methods. However they also continue with the steps from CLIC in order to make progress with mental methods.

Step 1

Addition Column Methods

I can solve a 2d + 2d

$$\begin{array}{r} 36 \\ +\ 42 \\ \hline 78 \\ \hline \end{array}$$

This is the step where children are first introduced to a column method.

Children should be taught this step after 'CLIC: Addition Step 24' which provides the understanding to underpin the column method.

Inputting the foundations of understanding at this point is crucial, since all future column addition steps can be more quickly understood without the need to unpick them in great detail.

Note that here children are not 'crossing 10' with the total of each column, hence they are solving a 2d + 2d question but not any 2d + 2d question.

Step 2

Addition Column Methods

I can solve any 2d + 2d

$$\begin{array}{r} 76 \\ +\ 48 \\ \hline 124 \\ \hline {\scriptstyle 1} \end{array}$$

Children should be taught this step after 'CLIC: Addition Step 25' which will provide the understanding to underpin the 'doing' of this step - particularly visualising the 'carrying of the 10'.

Therefore children will only be entering this step once they are competent with all 1d + 1d 'Learn Its', so that finding the total of each column is a non-issue.

The new learning for the child here is to 'carry the 10' and remembering to add it to the total of the tens column. Every child should have completely mastered this skill before moving on as it will be used again and again in future steps.

Step 1 — Subtraction Column Methods

I can solve a 2d - 2d

$$\begin{array}{r} 96 \\ -\ 42 \\ \hline 54 \\ \hline \end{array}$$

This is the step where children are first introduced to a column method for subtraction.

Children should be taught this step after 'CLIC: Subtraction Step 27' which ensures children can already understand subtracting a 2d number from a 2d number.

However, there is not a direct link between the high-understanding method and the column method for subtraction as there was for addition. This holds true as we progress up the column method Progress Drive for subtraction. One could explain to children what is 'really happening' during column subtraction (including with 'borrowing' later on), but it is a laborious discussion and, besides, the whole premise of Column Methods is that we sacrifice understanding for efficiency. All the more reason therefore that 'CLIC: Subtraction Step 27' has been secured prior to this step so that we know the 'high doing' mechanics taught here are being taught to already numerate children.

Note that here children are not needing to 'borrow' from the tens column, so here they are learning to solve a 2d - 2d question but not any 2d - 2d question. Therefore children will only be entering this step once they are competent with all 1d - 1d 'Learn Its', so that finding the difference between the top number and the bottom number of each column is a non-issue.

Step 2 — Subtraction Column Methods

I can solve any 2d - 2d

$$\begin{array}{r} {}^{6}\cancel{7}\,{}^{1}6 \\ -\ 48 \\ \hline 28 \\ \hline \end{array}$$

Here the pupil is faced with questions where they can not simply 'go down the columns' as they come across situations where the units digit in the bottom number is larger than the units digit in the top number.

The new learning for the child here is to 'borrow 10' from the next digit of the top number, remembering to cross it out and reduce it by 1 (really 10) and to write it in front of the units digit to create a mini-tens column with a small '1' in it. Every child should have completely mastered this skill at this step before moving on as it will be used again and again in future steps.

Therefore children will only be entering this step once they are competent with the ability to subtract 1d numbers from a number to 19 ('CLIC: Subtraction Step 12'), so that finding the difference between the top number (after the borrowing) and the bottom number of each column is a non-issue.

Step 1

Multiplication Column Methods

I can solve a 2d x 1d

$$\begin{array}{r} {}^{2}\,35 \\ \times\ \ 5 \\ \hline 175 \end{array}$$

This is the step where children are first introduced to a column method for multiplication.

Children should be taught this step after 'CLIC: Multiplication Step 11' which provides the understanding to underpin the column method.

Inputting the foundations of understanding at this point is crucial, since all future column multiplication steps can be more quickly understood without the need to unpick them in great detail.

Note that here children are not solving any 2d x 1d . Here the focus is just on multiplying by 2, 3, 4 or 5. If children have instant recall of these tables from the 'Learn Its' part of CLIC then we can isolate the new learning (i.e. the column method procedure). Hence, it can be any 2d number but the 1d number would be either 2, 3, 4 or 5.

Obviously the first new issue is to present the question as a formal column method, and for children to recognise it as a familiar 1d x 2d question.

Then, the next new learning point is that the 2d product of the 1d times 1d multiplication is split so that the units digit from the answer goes into the units digit space for the overall answer, but the tens digit is carried into the tens column ready to add to the answer from the next stage.

Step 1 here also assumes children have mastered Smile Multiplication (understanding and doing) from the It's Nothing New part of CLIC. This is crucial since it explains why when we move to multiply the tens digit from the 2d number by the 1d number we can think of it as a 1d x 1d question (the 'tables bit' from Smile Multiplication). We now have an amount of tens. If we remember to add on the tens from the initial 1d x 1d stage then we have the overall amount of tens, and because we have already written in the units digit for the overall answer then we are automatically recording the amount of tens in the tens column (and possibly extending into the hundreds column).

Therefore, we can easily see the understanding behind the efficiency of this method. As we progress up the Multiplication Column Method Progress Drive we can unpick the understanding as much as is useful and relevant, and as much as the children are able, but it is clearly a good investment to take the time to link the high understanding of the 1d x 2d step to the column method procedure for 2d x 1d at this introductory step.

In fact children may well learn to solve this step 'brain only' as they move along the FAB continuum (see 'CLIC: Multiplication Step 11').

Step 1 — Division Column Methods

I can solve a 2d ÷ 1d (using x2,3,4,5)
No remainders inside question

$$\begin{array}{r|l} & 23 \\ \hline 3 & 69 \end{array}$$

This step introduces the children to division using the layout sometimes known as the 'bus-stop'.

Children should be taught this step after 'CLIC: Division Step 18' which provides the understanding to underpin this column method.

As with that step, the assumption here is that children know the relevant tables that they need with no hesitation (in this case x2,3,4,5).

Here, to begin with there are no remainders in the answer, although it is useful that children have already come across remainders in their high-understanding division steps since this adds ability and confidence to make this step easy. Hence, the new learning is just the skill of going along the columns and developing the verbal rhythm that goes with it, "Fours into 8 go 2, fours into 4 go 1."

Not only are there no remainders in the answer at this first step, there are also no remainders inside the question, i.e. as children move along the columns they find that the number divides perfectly e.g.

$$\begin{array}{r|l} 2 & 48 \end{array}$$

$$\begin{array}{r|l} 3 & 96 \end{array}$$

$$\begin{array}{r|l} 4 & 84 \end{array}$$

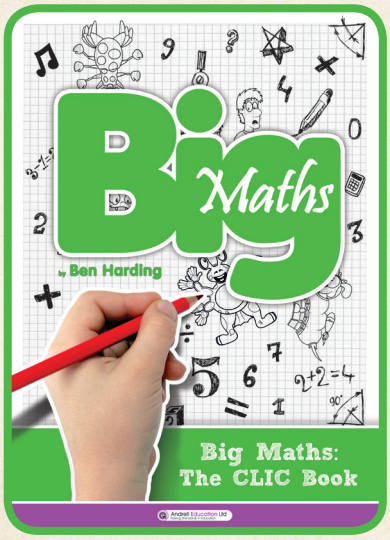
$$\begin{array}{r|l} 5 & 55 \end{array}$$

Big Maths

by Ben Harding

For further information about Big Maths and other professional development courses go to

www.AndrellEducation.com



The CLIC Book
Also Available

The CLIC Book contains all of the resources needed to implement Big Maths in school. Big Maths seeks to address the common lack of confidence shown by children.

It provides teachers with common and consistent messages for use throughout school. This gives children a smoother development journey and aids rapid progress.

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