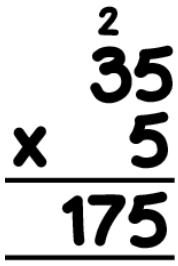
Column methods we use at St Barnabas

Calculating with Big Maths

Multiplication

Step 1



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

Children should be taught this step after 'Basic Skills: Multiplication: Step 11' which provides the understanding to underpin the Column Method.

Confirming that the foundations of understanding are in place at this point is crucial, as 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 . At this stage, 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 x 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.

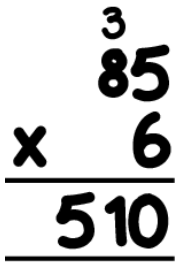
Step 1 here also assumes children have mastered INN: Multiplication (understanding and doing) from the It's Nothing New part of CLIC. This is crucial since it explains why when we move to multiply the tens digit from the 2d number by the 1d number we can think of it as a 1d x 1d question (the 'tables 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 'Basic Skills: Multiplication: Step 11').

Step 2



Children should be taught this step after 'Basic Skills: Multiplication: Step 14 ' which provides the understanding to underpin the column method.

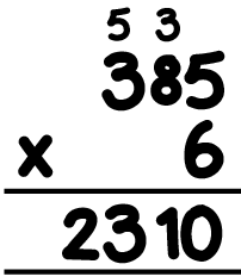
Indeed this step is identical to Step 1 except that we now have *any* 1d number and therefore *any* 2d x 1d question. This of course means that the children only enter this step with all of their 1d x 1d 'Learn Its' secure. Hence, there is a parallel line of progression to the high understanding methods, with exactly the same principles at play.

Accordingly, teachers may choose to build up the questions 'as and when' children secure the recall of their 'Learn Its' as opposed to waiting until all 1d x 1d 'Learn Its' are secure before returning to 2d x 1d Column Methods.

With recall secure we can now assume, from this step onwards, that learners can go straight into tackling *any* type of question at each step.

In fact children may well learn to solve this step 'brain only' as they move along the FAB continuum (see 'Basic Skills: Multiplication: Step 14').

Step 3



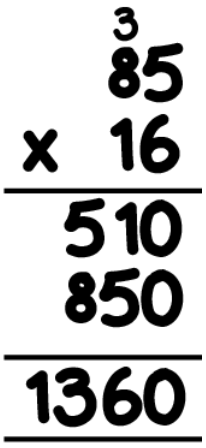
There is very little new learning here, except now we also have a hundreds digit to multiply by the single digit number. Naturally, the same principles of carrying the digits across into the next column apply as we work from right to left.

Again we can explain the understanding to the learner as we can see the INN: Multiplication question of the hundreds digit being multiplied by the single digit number as an 'amount of hundreds'.

It is therefore useful to teach this step soon after 'Basic Skills: Multiplication: Step 15'.

In fact children may well learn to solve this step 'brain only' as they move along the FAB continuum (see 'Basic Skills: Multiplication: Step 15').

Step 4



At this step pupils have a slightly new procedure to learn since we are now multiplying by a 2d number instead of a 1d number.

The first part is of course identical as we multiply by the units digit.

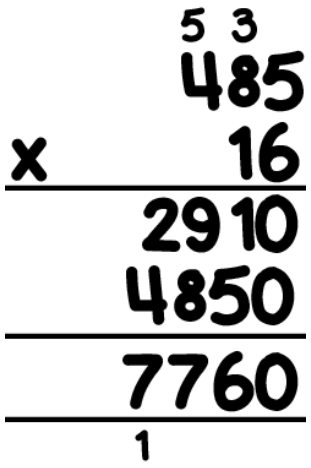
Then we need to multiply by the tens digit (the answer for that is written underneath the answer for the units digit). Before going into the 'tables bit' we write a zero in the units space for the answer for this mini-stage. Again we can see the value of INN: Multiplication if we want children to understand why we do this. Immediately we are

into finding out an 'amount of tens' since the zero has shuffled the 'tables bit' into the tens column.

The final stage is to add the 2 separate mini-answers. This is a straightforward affair since the numbers are already in columns, and the children have already mastered this standard of column addition.

It is very useful to build on the children's high understanding methods in CLIC, progressing to show 2d x 2d as grid multiplication. This can be effective before, during or even after this column method is taught if we want to keep understanding high without selling out to efficiency (see 'Basic Skills: Multiplication: Step 16'). This layer of understanding is important to begin with but can soon be dropped as we begin to focus purely on efficiency.

Step 5



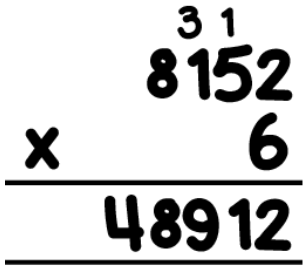
Again, there is not much new learning here.

Learners have already grasped the new skills of multiplying by a 2d number, here we just extend both mini-stages to multiplying by a hundreds digit.

Even if it just takes a few moments it is worth showing the 3d x 2d grid that provides the understanding to underpin the 'doing' of this column method step (see 'Basic Skills: Multiplication: Step 19').

This means we could end up with a 4d and a 5d number to add together at the end. In other words, if we accept that the key to having correct answers for Column Methods is to a) know what to do and b) do it carefully, then the key focus at this step is 'b'...to do it carefully!

Step 6

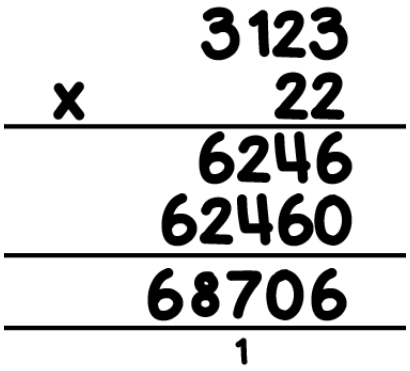


This step just seeks to take the child's skills a step further, and without much of a cognitive stretch.

The mechanics of moving along the columns are already in place here so the extension into 4d numbers should not pose any further issues other than the need to continue to focus on doing it carefully!

Although we have not started to multiply by decimals yet, it is useful to represent the 4d as an amount of money (i.e. 4582 becomes £45.82, and so 4582 x 7 can become £45.82 x 7).

Step 7

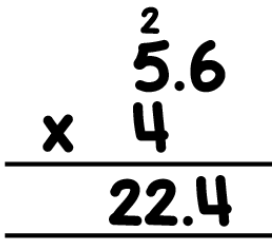


Similar to Step 6, there is no new learning here but the scope of each question increases. This means pupils will have to be very focused if they are to continually produce correct answers, and that as teachers our emphasis shifts to encouraging focus and carefulness.

Again, although we have not started to multiply by decimals yet, it is useful to represent the 4 digits as an amount of money (i.e. 4582 becomes £45.82, and so 4582 x 57 can become £45.82 x 57).

Before leaving the multiplication of whole numbers it is also worth considering stretching pupils to multiply 3d numbers by 3d numbers (placing 2 zeros in the third mini-stage answer space before addressing the tables bit as an 'amount of hundreds').

Step 8



The understanding for this step is again secured through the CLIC journey. In fact children may well learn to solve this step 'brain only' as they move along the FAB continuum (see 'Basic Skills: Multiplication: Step 17').

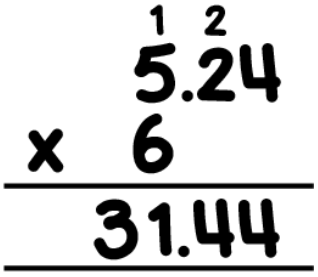
Nevertheless it is useful to ensure that this step is mastered since it is the very first step of using column methods to multiply decimal numbers.

Learners have already mastered the mechanics of column method multiplication by now, indeed this step is extremely similar to Step 1 here. They have also got a very good understanding of decimals by this point from CLIC (e.g. Place Value) and they also have succeeded with pure multiplication of decimals at Step 4 of the INN: Multiplication Progress Drive. This means the only new learning here is the slight shift to managing the decimal point successfully.

When it comes to setting out the question, we should be pedantic and insist on aligning the 1d number under the units digit as in the example shown. This then gives us the reasoning to pull the decimal point down into the answer knowing the columns are strong and immovable from the question into the answer space.

When we come to multiply the tenths by the units then we can again see the power of It's Nothing New, because although we might think 'Four 6s are 24', we want children to understand that we are really thinking 'Four lots of 6 tenths are 24 tenths'. This then makes sense when we explain why we place the units digit of the mini-answer into the tenths column and then carry the tens digit of the mini answer into the units column for the overall question.

Step 9



This is a slight progression from Step 8 and the understanding foundations are again found in CLIC (see 'Basic Skills: Multiplication: Step 18').

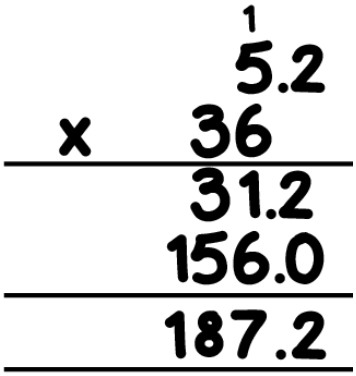
It is also very similar to Step 3 here, indeed if pupils transferred Step 2 here into money questions, then here we take off the pound sign and continue 'as we were'. Whether we have or haven't taken that door into this step we should extend mastery of this step into money and other measures.

Furthermore, we are also used to multiplying by decimals using the column method now, and so the new learning is just the introduction of the hundredths column.

Again it is important to align the units digits in both numbers in the question. Now we can see the hundredths digit multiplied by the units digit as an 'amount of hundredths'. This layer of understanding is important to begin with but can soon be dropped as we focus on efficiency.

It is also useful to extend this step into a progressive mini-step of multiplying numbers with 3dp by a 1d number. This can then be extended into the context of measures such as 1.832 Km x 4, or 3.829 Kg x 8 etc.

Step 10



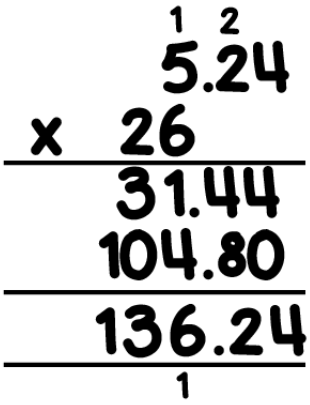
As with Step 4, there is a larger increase in progression here as we take on a new procedure. Now we are multiplying a decimal by a 2d number. However, it is still similar to previous steps multiplying by 2d numbers.

Again, setting the question up should involve keeping the columns aligned and the decimal point can therefore be brought down to the mini-stage answer spaces and the overall answer space.

Initially, multiplying the decimal number by the units digit of the 2d number is identical to Step 8 here.

Then, as we start to multiply the decimal number by the tens digit of the 2d number we can see that we need to shuffle the digits one column to the left, this is done by inserting a zero in the tenths column before continuing as normal. Again, showing the understanding to pupils in a grid multiplication format is very useful. This allows us to explain each step within the grid, using the understanding of INN: Multiplication and the principle of swapping the thing (i.e. Swapping the Units).

Step 11



Initially, multiplying the decimal number by the units digit of the 2d number is identical to Step 9 here (this step is also similar to 3d x 2d from Step 5 here).

Yet again, setting the question up should involve keeping the columns aligned and the decimal point can therefore be brought down to the mini-stage answer spaces and the overall answer space.

Then, as we start to multiply the decimal number by the tens digit of the 2d number we can see that we need to shuffle the digits one column to the left, this is done by inserting a zero in the hundredths column before continuing as normal.

Since we are multiplying numbers with 2dp there are clear opportunities to extend this step into the context of money.

Further extensions could include multiplying decimal numbers by 3d numbers, or extending the decimal number to 3dp numbers (and therefore into the context of Km and Kg etc.)...or both!