

PRIMARY EDUCATION.

MULTIPLICATION.

The first step in the teaching of multiplication is to teach a multiplication table. In building up a table objects should be used at first. The next step might be to make the multiplication table by addition. The pupil may be taught to make the table for himself. If he wishes to make the table of 3 times, he starts with one 3. To this he adds another 3 and finds that $2 \times 3 = 6$. He continues in the same way to $12 \times 3 = 36$.

The multiplication table should be memorized in the same way as the addition table, that is, the pupil should get a mental picture of the table as he sees it on the board, on the slate, or on the note book. To assist the pupils to get this mental picture have the tables on the board where they can see them as they do their multiplication questions, but get them to compete in an effort to do the work without looking at the tables as soon as possible.

As soon as the tables of twos and threes have been learned by the pupils they should begin to use them in multiplying. There are two methods of writing the multiplication tables, e. g. the table of threes or three times table may be written thus:

$1 \times 3 = 3$	or	$3 \times 1 = 3$
$2 \times 3 = 6$		$3 \times 2 = 6$
$3 \times 3 = 9$		$3 \times 3 = 9$
$4 \times 3 = 12$		$3 \times 4 = 12$
$5 \times 3 = 15$		$3 \times 5 = 15$
$6 \times 3 = 18$		$3 \times 6 = 18$
$7 \times 3 = 21$		$3 \times 7 = 21$
$8 \times 3 = 24$		$3 \times 8 = 24$
$9 \times 3 = 27$		$3 \times 9 = 27$
$10 \times 3 = 30$		$3 \times 10 = 30$
$11 \times 3 = 33$		$3 \times 11 = 33$
$12 \times 3 = 36$		$3 \times 12 = 36$

The usual way of repeating the table to the left is: one three is three; two threes are six; three threes are nine, etc., while the table to the right would be repeated: three ones are three; three twos are six; three threes are nine, etc. Some use the word "times," thus one times three is three; two times three are six, etc. If multiplication is begun as soon as the tables of twos and threes are learned questions must be used to agree with the form of table used. If the table to the left is used no figure in the multiplicand should exceed 3, while any number from 1 to 12 may be used in the multiplier. If the table to the right is used any of figures from 1 to 9 may be used in the multiplicand, but no figure higher than 3 may be used in the multiplier. If the form of the left hand table is used a very simple method of supplying drill in which the pupils may do the work and prove the result is as follows, e. g., multiply say 213 by

2 thus $\begin{array}{r} 213 \\ 426 \\ \hline \end{array}$, then write the multiplicand twice and add, thus $\begin{array}{r} 213 \\ 213 \\ 426 \\ \hline \end{array}$ then use the same multiplicand and multiply by 3 and prove by adding the 213 to the sum 426. Proceed in the same way using as multiplier the numbers 4, 5, 6, etc., to 12, and proving the work in the same way. In this way the pupils get drill without taking much of the teacher's time.

When the table of fours has been learned, fours may be used in the multiplicand, and so on with the numbers to 9.

If the form of table to the left is used the tables of tens, elevens and twelves are only used in mental work.

The principle of carrying may be arrived at the same as in addition. When two or more figures are used in the multiplier, if it is thought advisable to teach the reason for the position of the several partial products which, when added, gives the complete product, the following method may be found convenient. Show that any order such as units, tens, hundreds, etc., when multiplied by units gives a product in the same order, e. g., take 3 units 2 times and the result is 6 units; take 3 bundles of tens 2 times and the result is 6 tens, and so on with hundreds, thousands, etc.

Next show that when the 2 units are taken 3 tens times, that is, when 2 units are taken 30 times the result is 60 units or 6 tens.

$$\begin{array}{r} \text{Take for example } 42 \times 23 = \\ \begin{array}{r} 42 \\ \times 23 \\ \hline 126 \\ 84 \\ \hline 966 \end{array} \end{array}$$

Thus it may be shown that when you use the second or tens figure in the multiplier you are taking the 2 units in the multiplicand 2 tens times, that is 20 times, which gives 40 units or 4 tens, and the reason can be seen for placing the 4 tens under the two tens in the first partial product. Since we all do our work of adding, subtracting, multiplying and dividing without any thought of the reason for the various steps in the process many may consider any time taken in teaching the reason is wasted. Since so much of the work in arithmetic must be reasoned apart from all rules or mechanical operations the earlier we can create in the pupil a desire to know the reason for everything he does, the better.

Teach that multiplication is used to put together numbers that are all alike and to find how much they all amount to.—Amos O'Blenes.

SCHOOLING WITHOUT SCHOOL.

"Our principal indictment of elementary education is that it is administered by those of little faith in the child. I fear it has too much faith in itself and in methods to have much left over for anything else." W. Follett.—Harper's.