

Some Creative And Easy Methods To Calculate A Multiplication Of Two Numbers

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Abstract

In primary school, some students find a difficulty in calculating a multiplication of two numbers. Moreover, students only familiar with certain method to solve the problem. Actually, there are some methods that much easier to multiply numbers. In this paper, some of those techniques will be discussed, such as lattice multiplication, grid multiplication, and using reference number method. Those methods will be also explained from algebraic point of view.

Keywords: lattice multiplication, grid method, using reference number

I. INTRODUCTION

The fundamental of mathematics operations on numbers such as addition, subtraction, multiplication and division are basic mathematical concept to be taught at primary school. To improve the ability of students on that material, need an innovation in learning. The usually method in learning multiplication that used by teachers is a long multiplication. For example we would multiply 12×13 . Then it would be performed as follows:

$$\begin{array}{r}
 12 \\
 13 \times \\
 \hline
 36 \\
 12 \quad + \\
 \hline
 156
 \end{array}$$

By using the above method, sometimes students make mistakes in doing multiplication that must write the carried digit. For example students ask to multiply 23×27 . Then it can happen that the answer is 601 or 501.

Actually there are several ways to calculate the multiplication of two numbers. By this paper, it will be discussed several methods that can be used as an alternative to learn multiplication. In the method that will be discussed below, there are some methods that might be perceived as being more convenient for students, especially for some conditions such as multiplying the numbers that close to 10 or 100.

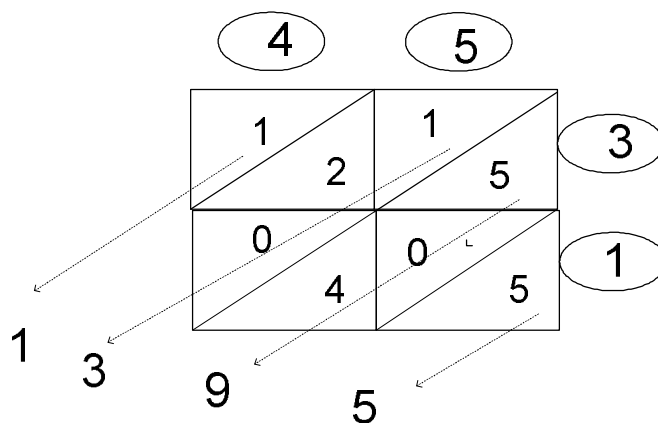
II. DISCUSSION

Beside of the usually method to calculate multiplication of two numbers as mention above, there are some methods that can be tried to improve skill of calculating multiplication technique.

1. Lattice Multiplication

Lattice multiplication is a method of multiplication that uses a lattice to multiply two numbers. It is also known as sieve multiplication, shabakh, or the Hindu lattice. It was described by Al-Khwarizmi in the 9th century, and brought to Europe by Fibonacci. It's like traditional long multiplication, but it breaks the multiplication process into smaller steps, which some students find easier. The digits to be carried are written within the box, making them harder to miss.

The example below, explains how this method works. Let's multiply 45×31 . First write the 45 across the top, and the 31 down the right side of the box as figured below:



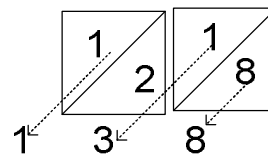
The next step is filling the box by multiplying the two digits found at the head of the column and to the right of the row. When the partial product is two digits, the first digit goes above the diagonal and the second digit goes on the lower right of the diagonal. If the partial product is only one digit, a zero is placed in the triangle above the diagonal in the box. After that, we add along the diagonals beginning in the lower right to get the final product. In the example above we get $45 \times 31 = 1395$.

We can also use a table below to get more quickly in computing a multiplication.

①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	X
0/1	0/2	0/3	0/4	0/5	0/6	0/7	0/8	0/9	0/0	1
0/2	0/4	0/6	0/8	1/0	1/2	1/4	1/6	1/8	0/0	2
0/3	0/6	0/9	1/2	1/5	1/8	2/1	2/4	2/7	0/0	3
0/4	0/8	1/2	1/6	2/0	2/4	2/8	3/2	3/6	0/0	4
0/5	1/0	1/5	2/0	2/5	3/0	3/5	4/0	4/5	0/0	5
0/6	1/2	1/8	2/4	3/0	3/6	4/2	4/8	5/4	0/0	6
0/7	1/4	2/1	2/8	3/5	4/2	4/9	5/6	6/3	0/0	7
0/8	1/6	2/4	3/2	4/0	4/8	5/6	6/4	7/2	0/0	8
0/9	1/8	2/7	3/6	4/5	5/4	6/3	7/2	8/1	0/0	9

Let's calculate 46×3 . From the above table, we get :

①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	X
0/1	0/2	0/3	0/4	0/5	0/6	0/7	0/8	0/9	0/0	1
0/2	0/4	0/6	0/8	1/0	1/2	1/4	1/6	1/8	0/0	2
0/3	0/6	0/9	1/2	1/5	1/8	2/1	2/4	2/7	0/0	3
0/4	0/8	1/2	1/6	2/0	2/4	2/8	3/2	3/6	0/0	4
0/5	1/0	1/5	2/0	2/5	3/0	3/5	4/0	4/5	0/0	5
0/6	1/2	1/8	2/4	3/0	3/6	4/2	4/8	5/4	0/0	6
0/7	1/4	2/1	2/8	3/5	4/2	4/9	5/6	6/3	0/0	7
0/8	1/6	2/4	3/2	4/0	4/8	5/6	6/4	7/2	0/0	8
0/9	1/8	2/7	3/6	4/5	5/4	6/3	7/2	8/1	0/0	9



To multiply two digits number or more, let's try to calculate 345×23

1	2	3	4	5	6	7	8	9	0	X										
0	1	0	2	0	3	0	4	0	5	0	6	0	7	0	8	0	9	0	0	1
0	2	0	4	0	6	0	8	0	1	2	0	4	0	6	0	8	0	1	2	2
0	3	0	6	0	9	0	1	2	1	5	0	1	8	2	1	2	4	2	7	0
0	4	0	8	1	2	1	6	2	0	2	4	2	8	3	2	3	6	0	0	4
0	5	1	0	1	5	2	0	2	5	3	0	3	5	4	0	4	5	0	0	5
0	6	1	2	1	8	2	4	3	0	3	6	4	2	4	8	5	4	0	0	6
0	7	1	4	2	1	2	8	3	5	4	2	4	9	5	6	6	3	0	0	7
0	8	1	6	2	4	3	2	4	0	4	8	5	6	6	4	7	2	0	0	8
0	9	1	8	2	7	3	6	4	5	5	4	6	3	7	2	8	1	0	0	9

From row 3

0	1	1
9	2	5

= 1035

From row 2

0	0	1
6	8	0

= 6900 +

= 7935

2. Grid Method

The grid method is a form of long multiplication which breaks up one of the numbers and then uses the distributive law, that is $a(b+c) = ab + ac$. For example, we want to calculate 45×31 . So, with this method it becomes:

$$45 \times 31 = 45 \times (30 + 1) = 45 \times 30 + 45 \times 1$$

Using the grid method, 45×31 would look like this:

	40	5	
30	1200	150	= 1350
1	40	5	= 45 +
			= 1395

In this method, we look that it may be less efficient than the traditional method. But, it is considered to be more reliable, in that students are less likely to make mistakes.

3. Using Reference Number

This method was developed by Bill Handley. It seems easier to calculate

multiplication of two numbers in which the number close to 10 or 100. For example, we want to multiply 12×13 . In this case, we use 10 as reference number. Write down 12×13 and then draw a circle below each number to be multiplied.

$$\begin{array}{ccc} \textcircled{10} & 12 & \times & 13 \\ & \bigcirc & & \bigcirc \end{array}$$

The 10 in the circle is our reference number. The first number to be multiplied is 12 and $12 = 10 + 2$, so we put 2 in the circle below 12. Since $13 = 10 + 3$, we put 3 in the circle below 13.

$$\begin{array}{ccc} \textcircled{10} & 12 & \times & 13 \\ & \textcircled{2} & & \textcircled{3} \end{array}$$

Finally, add the number diagonally and multiply the number in the circle. So we get $12 + 3 = 13 + 2 = 15$ and $2 \times 3 = 6$. Thus 156 is the answer.

$$\begin{array}{ccc} \textcircled{10} & 12 & \times & 13 \\ & \textcircled{2} & & \textcircled{3} \\ & \longrightarrow & & \longrightarrow \\ & & & =15 \ 6 \end{array}$$

Thus, with this method, we can calculate 97×98 quickly as below:

$$\begin{array}{ccc} \textcircled{100} & 97 & \times & 98 \\ & \textcircled{-3} & & \textcircled{-2} \\ & \longrightarrow & & \longrightarrow \\ & & & =950 \ 6 \end{array}$$

We get $97 \times 98 = 9506$.

Here is the algebraic explanation for this method. Let's we want to calculate $(a + b) \times (a + c)$. We get:

$$\begin{aligned}(a + b) \times (a + c) &= a^2 + ab + ac + bc \\ &= a(a + b + c) + bc\end{aligned}$$

Substituting number for 12×13 , we get :

$$\begin{aligned}(10 + 2)(10 + 3) &= 10(10 + 2 + 3) + 2 \times 3 \\ &= 10(12 + 3) + 2 \times 3 \\ &= 10(15) + 6 \\ &= 156\end{aligned}$$

III. CONCLUSION AND SUGGESTION

For proficient in math, students need considerable practice. A student will not be skilled at completing a math problem if he or she rarely practiced. Beside of that, the teachers should make innovations in mathematics learning and also motivate their students to succeed.

Some of the above methods can be tried as a variation in learning multiplication Although not free from shortcomings, by learning the above methods students are given the freedom to choose which one of the methods he like in order to improve skills in mathematics.

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