Journal of Mathematical Problems, Equations and Statistics

**E-ISSN:** 2709-9407
**P-ISSN:** 2709-9393
JMPES 2021; 2(2): 23-24

www.mathematicaljournal.com
Received: 10-04-2021
Accepted: 12-06-2021

**Zhang Yue**
Department of Physics,
Hunan Normal University,
Chang Sha, China
e-mail:
phys_zhangyue@126.com.

**Correspondence**
**Zhang Yue**
Department of Physics,
Hunan Normal University,
Chang Sha, China

# The simple and quick method of the multiplication

## Zhang Yue

**Abstract**

With respect to the multiplication between the two digit numbers $ab$ and $ac$, and $b+c=10$; or $ab$ and $cb$, and $a+c=10$, the paper respectively proposes theorem 1 and theorem 2. According to these two theorems, the results of the multiplications can be obtained by the simple mental arithmetic. Moreover, the paper presents some examples of multiplication in order to verify that both of the theorem 1 and theorem 2 are correct and applicable.

**Keywords:** $ab \times ac$, $b+c=10$, $ab \times cb$, $a+c=10$, example

**Introduction**

Although the calculation about addition; subtraction; multiplication; and division is the arithmetic for pupils learning in elementary school, studying and discovering the simple and quick method of the calculations is an interesting and significant topic for our people [1, 3]. For example, about 40 years ago, the people's daily (in China) reported that some scholar invented a quick method of calculation with the abacus; moreover, when we studied in the elementary school, we studied a simple method of calculating the squares of those numbers whose last digit is 5. This paper will propose a simple and quick method of multiplication, which can change the complex calculation with pen or pencil into the mental arithmetic.

**The multiplication 1**

**1) Theorem 1:** If a two digit number $ab$ multiplys another two digit number $ac$, namely $ab \times ac$, and $b+c=10$. Thus, the result of the multiplication of the two numbers is simply consists of $a \times (a+1)$ and successively following by the result of multiplication $b \times c$.

The proof: According to the theorem 1,

$$ab \times ac = (10a+b)\times(10a+c) = 100a^2 + 10a \times c + 10a \times b + b \times c = 100a^2 + 10a \times (b+c) + b \times c \qquad (1),$$

because $b+c=10$, therefore, eq. (1) is written

$$ab \times ac = 100a^2 + 100a + b \times c = 100a \times (a+1) + b \times c \qquad (2).$$

Because $a<10, b<10, c<10, b \times c < 100$, $100a \times (a+1)$ means that the result of $a \times (a+1)$ is justly in front of the result of $b \times c$. The theorem 1 is proven.

**2) Examples**

Example 1: calculating 24×26=?

The solution: Because 4+6=10, according to theorem 1, 2×(2+1)=6, 4×6=24, therefore, 24×26=624 (3).

Example 2: calculating 57×53=?

The solution: because 7+3=10, according to theorem 1, 5×(5+1)=30, 7×3=21, therefore, 57×53=3021 (4).

Example 3: calculating 76×74=?

Because 6+4=10, $7\times(7+1)$ =56, $6\times4$=24, therefore,
$76\times74$=5624 (5).

People can check all the above multiplications and operate the similar multiplications according to the theorem 1 with mental arithmetic, is there any mistake in the multiplications?

**The Multiplication 2**

1) Theorem 2: If a two digit number $ab$ multiplys another two digit number $cb$, namely $ab\times cb$ and $a+c=10$. Thus, the result of the multiplication of the two numbers is simply consists of $100\times(a\times c+b)$ and successively following by the result of multiplication $b\times b$; namely $100\times(a\times c+b)+b\times b$.

**The proof:** According to the theorem 2,

$$ab\times cb=(10a+b)\times(10c+b)=100\times a\times c+10\times b\times(a+c)+b\times b \quad (6),$$

because $a+c=10$ ,therefore, eq.(6) is written

$$ab\times\ cb=100\times a\times c+100\times b+b\times b\ =$$
$$100\times(a\times c+b)+b\times b \quad (7).$$

As the same reason, $a<10, b<10, c<10, b\times c<100$, the result of eq.(7) is justly the result of $(a\times c+b)$ then successively following by the result of $b\times b$.

The theorem 2 is proven.

**2) Examples**

Example 1: calculating $32\times72$=?
Solution: Because 3+7=10, according to the theorem 2, $3\times7$+2=23, $2\times2$=04, therefore, $32\times72$=2304 (8);

Example 2: calculation $78\times38$=?
Solution: Because 7+3=10, $7\times3$+8=29, $8\times8$=64, therefore, $78\times38$=2964 (9);

Example 3: calculating $84\times24$=?
Solution: Because 8+2=10, $8\times2$+4=20, $4\times4$=16, therefore, $84\times24$=2016 (10).
It can be verified that all the above multiplications must be correct by the mental arithmetic.

**Conclusion**

With respect to the multiplication, the paper proposed two theorems and proved them. Through some examples it can be found that according to the two theorems, the results of a lot of complex multiplications can be easily and quickly obtained without using pen or pencil. In fact, the results of those multiplications can be directly written by mental arithmetic according to the two theorems. Moreover, the two theorems can be also applied to all the similar multiplications between two numbers with more than two digit.

**References**

1. John W. Koshmider, Mark H. Ashcraft. The development of children's mental multiplication skill [J]. Journal of Experimental Child Psychology 1991;51(1):53-89.
2. Manohar Mathur, Aarnav. Demystification of Vedic Multiplication Argorithm [J]. Amrican Journal of Computational Mathematics 2017;7(1):94-101.
3. Hiroyasu Ito, Wamiko Kubo-Kawai, Nobuo Masataka. The Role of Learning the Japanese KuKu Multiplication Chant in Simple Arithmetic Operations [J]. Creative Education 2011;2(3):276-278.