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Theorem of Multiplying a Two-Digit Number ab by a Series of 1s

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Abstract: This article presents a general theorem for multiplying a two-digit number ab by a number made up of consecutive 1s (e.g., 11, 111, 1111…). The proposed rule is to keep the digits *a* and *b* of the number being multiplied as the left and right ends of the product, and to insert between these two digits the sum *a+b* a certain number of times. *z* (Zawadi), the parameter for inserting the sum *a+b*, is determined by the number of digits in the multiplier. The general theorem and the two particular cases are established and illustrated with examples. This method offers a simple and practical alternative to conventional multiplication. It provides learners, teachers, and researchers with calculation skills and makes the use of a calculator almost useless.

Keywords:

- *ab is the Multiplicand;*
- *(111...) is the multiplier;*
- *N is the Number of 1s in the Multiplier;*
- *z (Zawadi) is the Parameter that Determines How Many Times the Sum of the Digits a and b of the Multiplicand is Inserted between the Digit a and the Digit b to Get the Product;*
- *z-1 is the Number of Times the Second Digit is Inserted.*

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I. INTRODUCTION

In today's era where science and technology are advancing rapidly, digital tools are becoming a part of everyday life at all levels; in learning environments, professional settings, and daily life. This revolution is leading people to rely less and less on their cognitive resources and automatically pushes them toward intellectual laziness.

School programs are working to limit the overuse of digital tools, especially calculators in our case. Mental math is still a useful skill both in studies and everyday life. Yet, many students struggle with math operations, particularly multiplication. Finding simple and reliable methods that provide tips for doing complex calculations quickly, without using a calculator, helps make math more accessible and supports this approach to teaching.

This work, born from a scientific curiosity of the co-author, comes after a school assignment on multiplying a number by 11. Finding this method simple and fascinating, she practiced through trial and error to see if this technique could be applied to other numbers. So she tried multiplying by 111, 1111, 11111, 1111111…

By practicing on her own, she established a link between the multiplicand (ab) and the product and noted some principles that she shared with us. On our side, we worked to refine this study and theorize it thereby establishing the theorem.

After 11 months of work, trial and error, we present to you the result of our research: a theorem that combines simplicity and efficiency because it allows complex calculations by using your cognitive resources in record time without needing a calculator.

This article is structured as follows:

- *Statement of the General Principle for Multiplyinga Number ab by a Series of 1s*
- Hypotheses
- Special cases
- Conclusion.

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II. GENERAL PRINCIPLE

To multiply a two-digit number ab by a series of 1s, you get the product by taking the digits a and b of this number as the leftmost (a) and rightmost (b) digits, and inserting the sum of a and b (z) times in between. z is the number of times you insert the sum of a and b.

z = *N* -1.

ab x 111… = [a][a+b] repeated [z] times [b].

➢ *Hypotheses*

- ab is the multiplicand (the first term of the multiplication),
- A and b: are respectively the two digits (left and right) of the term to be multiplied by the series of 1s.
- The series of 1s is the multiplier (the second term of the multiplication). Example: 11; 111; 1111; 111111…
- This second term only contains the digit 1, and the number of 1s belongs to the set of natural numbers excluding zero.
- *z = N-1*, z is the number of times a+b is inserted between the two extreme digits of the product.

Note: when there is more than one insertion *(z >1)*, the insertions are done between a and b going from right to left.

➢ *Examples*

Ex 01. 12x1111=?

- 12 is the multiplicand
- a=1, the left digit of the multiplicand, and also becomes the leftmost digit of the product.
- b=2, the second digit of the multiplicand and the rightmost digit of the product.
- 1111: this is the series of 1s (the multiplier),
- N =4,
- a+b , the digit to insert between the ends of the quotient. a+b = 1+2=3.
- z: the number of times to insert a+b. z = N-1,

so z= 4-1=3

12x1111= [a][a+b] repeated[z] times [b].

12x1111= [1] [1+2] repeated [3 times] [2]

= [1][3] repeated three times [2]

=1 333 2

Ex 02. 15 x 1111111 =?

= [a][a+b] repeated [z] times [b].

- a = 1, b = 5, N = 7 (number of 1s in the multiplier)
- z, the number of insertions, z = 7 - 1 = 6,
- a + b (the digit to insert between a and b) = 1 + 5 = 6

So 15 x 1111111 = [1] [1+5] repeated [6] times [5]

= 1[6][6] times [5]

= 1 666666 5

EX 03. 15 x 11111111111 = ?

- a = 1, b = 5, N = 11 (we have eleven 1s),
- Z, the number of insertions between a and b, z = 11 - 1 = 10
- a + b, the digit to insert between a and b, a + b = 1 + 5 = 6

So: 15 x 11111111111 = [1] [6] [10] times [5]

= 1 6666666666 5

EX 04. 72X111111111111111=?

- a=7, b=2, N=15,
- z =15-1=14
- a+b =7+2=9

So 72x111111111111111=7999999999999992

EX 05. 36X1111111111111111111=?

- a =3, b=6, N= 21,
- z =21-1=20
- a+b =3+6=9

So: 36x1111111111111111111=

= 3999999999999999999996

III. SPECIAL CASES

➢ *1st Special Case: a+b > 9, z=1 and N=2.*

When a+b>9, the sum of *a* and *b* is a two-digit number *m* and *g* (with *m*=1). *m* is the tens digit and g is the units digit of the sum *a+b*. And when *z*=1, consequently, the series of 1s is 11, so we have a single insertion which is *g*.

This case has the form abx11. The solution is:

abx11 = [a+1] [g] [b]

Ex 06. 29x11= ?

a = 2, b = 9. N = 2,

- *z*, the number to insert, *z* = 2-1 = 1.
- a+b = 2+9=11, a+b is greater than 9 and z = 1. (First special case).
- *a+b*=11 so: *m* = 1 and *g* = 1.

The ends of the product are: [a+1] and [b]

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So: 29x11= [a+1] [g][b]

= [2+1] [1][9]

= 319.

➢ *2nd Special Case: a+b > 9; z > 1 and N>2*

This case takes into account the multiplications of ab with all series of 1, except 11, and with the sum a+b greater than 9.

Statement of the rule for the 2nd special case: To multiply the term ab by a series of 1s (with N>2), when *a+b* >9 and z >1, the product is obtained as follows:

- The leftmost digit of the product is [a+1] while the rightmost digit is [b].
- Between these two extreme digits, there are two insertions to make:
- The first insertion is *g* and
- The second insertion is [1+g] [z-1] times,

abx111… = [a+1][1+g] repeated [z-1] times [g][b].

Note:

- a+b = mg, with m being the tens digit (it is always 1) and g is the units digit of the sum a + b.
- g: the first digit to insert between the ends of the product,
- m+g: the second digit to insert (z-1) times
- *z* = N-1, the total number of insertions
- *z-1*, the number of times the second digit must be inserted
- All insertions are done from right to left.

Ex 07. 58x1111111111=?

- a=5, b=8. a+b=13 >9., N=10,
- a+b=5+8=13, (m=1 and g=3).
- z, number of insertions, *z*= N- 1=10-1=9.
- *a* +1=5+1=6. Leftmost digit of the product.
- b=8. Rightmost digit of the product.
- g=3. First digit to insert (unit digit of the sum a+b).
- (*m*+*g*) =1+3=4. Second digit to insert.
- z-1=9-1=8 times. Number of insertions of the 2nd digit

58x1111111111=[a+1] [second digit to insert] repeated [z-1] times [first digit to insert] [b]

= [a+1] [1+g] repeated [z-1] times [g] [b]

= [5+1] [4] repeated [9-1] times [3] [8]

= [6] [4] repeated 8 times [3][8]

58x1111111111= 64444444438.

Ex 08. 55x11111111111111= ?

- a = 5, b = 5, a+b=10 > 9. N=14,
- a+1=5+1=6. Leftmost digit
- b=5. Rightmost digit
- a+b=5+5=10, with m=1, g=0.
- g=0. First digit to insert.
- m+g=1+0=1. Second digit to insert.
- z=14-1=13
- (z-1) =13-1=12 times. Number of times to insert the 2nd digit.

55x11111111111111=[a+1][1+0] repeated [13-1] times [0][5]

= [5+1] [1] 12 times [0][5]

= 6 111111111111 05

Ex 09. 78x11 = ?

1st special case, because a+b > 9 and z=1 (the format is abx11)

- a=7, b=8, N=2,
- a+b=7+8=15,
- g=5, (g is the only insertion, see the first special case).

So: abx11 = [a+1] [g] [b]

78x11 = [7+1] [5] [8]

= 858

Ex 10. 78x111=?

- a=7, b=8, N=3,
- a+b=7+8=15 (m=1 and g=5), 2nd special case because a+b >9 and z >1.
- z=N-n+1=3-2+1=2. Since a+b>9 and z>1, we're in the 2nd special case.
- z-1=2-1=1. Number of insertions for the 2nd digit to insert.
- abx111…= [a+1] [1 + g] repeated [z-1] times [g] [b]
- g=5, the first digit to insert,
- m+g=1+5=6, the 2nd digit to insert and repeat.

78x111= [7+1] [1+5] [3-1] times [5] [8]

78x111= [7+1] [6] [2-1] times [5] [8]

= [8] [6] [1] times 5 8

= 8658

Ex 11. 89x1111111= ?

- a=8, b=9, N=7,
- 8+9=17, 17 >9, and z >1. 2nd special case
- m=1, g=7
- a+1=8+1=9, left end of the product
- b=9, right end of the product
- g=7, first digit to insert

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- m+g=1+7=8, 2nd digit to insert
- z=N-1=7-1=6
- z-1=6-1=5 times, number of times to insert the 2nd digit

So 89x1111111=[a+1][m+g] repeated[z-1] times[g][b]

= [8+1] [1+7] repeated [5] times [7] [9]

= [9][8] repeated [5] times [7] [9]

89x1111111= 9 88888 7 9

Ex 12. 89x11111111111111111111111= ?

(Voir Ex 11.)

N=25, g=7,

m+g=1+7=8, 2e chiffre à insérer

z=N-1=25-1=24

Nombre d'insertion de m+g; z-1=24-1=23.

89x11111111111111111111111=

=9888888888888888888888879

Ex 13. 99x1111111= ?

a+b=9+9=18>9 et z>1. 2e cas spécial

z=7-1=6 , m=1, g=8

= [a+1] [1+g] répété [z-1] fois [g][b]

= [9+1] [1+8] répété [6-1] fois [8] [9]

= [10] [9] [5] fois [8] [9]

99x1111111 = 10 99999 8 9

IV. CONCLUSION

This theorem about multiplying a two-digit number ab by a series of 1s gives a calculation method that's simply better than the conventional one. In calculating the product, we came up with the following:

- *The General Principle of Multiplication:*
  ab x 111… = [a][a+b] repeated [z] times [b].

- *The 1st Special Case, with a+b > 9, z=1 and N=2:*
  ab x 11 = [a+1][g][b]

- *The 2nd special Case, with a+b>9, z>1 and N>2:*
  ab x 111… = [a+1][1+g] repeated [z-1] times [g][b].

The general principle as well as its two particular cases, presented in this work, structure the theorem of multiplying a two-digit number ab by a series of 1s. It paves the way for other similar research in the field of mathematics. These calculation tricks clearly show that the human brain is capable of performing complex calculations without using a calculator in the age of artificial intelligence. We are currently working on publishing another similar article.

RÉFÉRENCES

[1.] MON CLASSEUR DE MATHS : HTTPS//MONCLASSEURDEMATHS.FR/CM/X11.
[2.] Zhang Yue, La méthode simple et rapide de la multiplication, Journal of Mathematical Problems, Equations and Statistics 2021:2(2):23-24.
[3.] Sushankar Das, Une nouvelle approche de la multiplication avec vérification, International Journal of Mathematics Trends and Technology (IJMTT) - Volume 65 Numéro 1 - Janvier 2019.
[4.] Guy BROUSSEAU, Professeur honoraire, LE CALCUL HUMAIN DES MULTIPLICATIONS ET DIVISIONS DES NOMBRES NATURELS, LACES / DAESL, Université Victor Segalen, Bordeaux 2, Grand N no. 85, 2010.