1 Introduction

Vedic period was one of the best times of Indian civilisation and many new advancements were made in all spheres of life.Mathematics,was particularly, a subject of interest. The Atharva Veda, [?] is one of the four Vedas and contains knowledge abouut everday procedures.The below method of multiplication has been derived from the Atharva Veda. [?]

2 Pseudocode

Algorithm 1 Multiplication of two numbers

Require: Two 2-digit numbers
 $x \leftarrow first\_number$
 $y \leftarrow second\_number$
 $n1 \leftarrow x/10$
 $m1 \leftarrow x\%10$
 $n2 \leftarrow y/10$
 $m2 \leftarrow y\%10$
 if $n1 == n2$ **and** $m1 + m2 == 10$ **then**
  $mul \leftarrow CASE1(n1, m1, m2)$
 end if
 if $n1 + n2 == 10$ **and** $m1 == m2$ **then**
  $mul \leftarrow CASE2(n1, n2, m1)$
 end if

Algorithm 2 CASE1

Require: 3 numbers from the calling function
 $a \leftarrow n1 * (n1 + 1)$
 $b \leftarrow m1 * m2$
 return $a * 100 + b$

Algorithm 3 CASE2

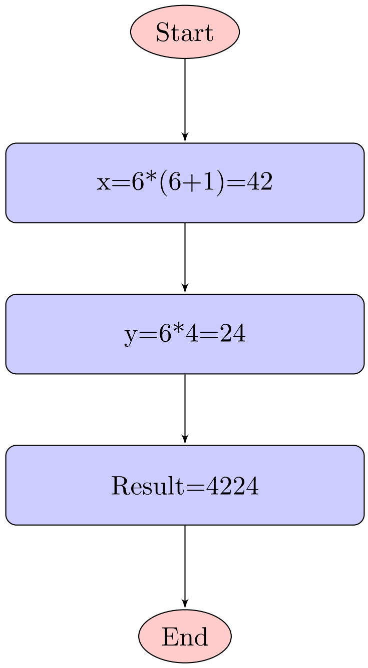
Require: 3 numbers from the calling function
 $a \leftarrow n1 * n2 + m1$
 $b \leftarrow m1 * m1$
 return $a * 100 + b$

3 Examples

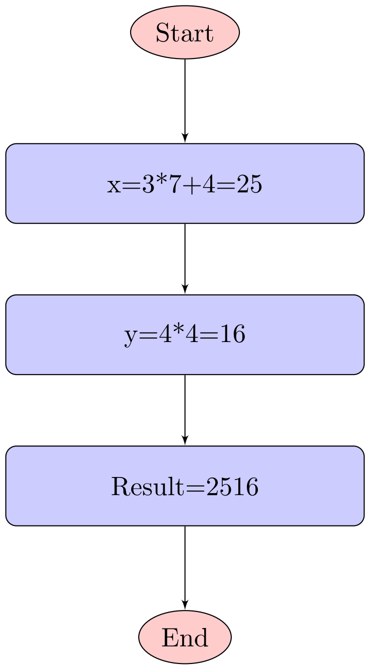
Let x denote the first two digits and y denote the last two digits of the resulting 4- digit number from the multiplication.

Figure 1: Examples

(a) Flowchart illustrating 66x64



(b) Flowchart illustrating 74x34



4 Explanations

4.1 How to do it mentally

The process of doing the calculation mentally has been given below.It borrows from section **??**.

1. Look at the two numbers
2. If their one's digits add upto 10 and their ten's digits are same,we got to step 3 else go to step 5.
3. Multiply the ten's digit with its succeeding number.This gives the ffirst two digits of the product.
4. Multiply their one's digits. This gives the last two digits and we have the complete number.
5. If their ten's digits add upto 10 and their one's digits are same,we got to step 6.[1]
6. Multiply their ten's digit and add the result to the one's digit.This gives the first two digits of the product.
7. Multiply their one's digits to get the last two digits of the product.
8. Hence we have the complete number.[2]

4.2 Advantages

The above method is advantageous due to the following reasons:

- Multiplication is performed on one digit numbers,which is elementary.
- No tedious additions

4.3 Algebraic

x denotes the first number.
y denotes the second number.
n1 denotes the ten's digit of the first number.
n2 denotes the ten's digit of the second number.
m1 denotes the one's digit of the first number.
m2 denotes the one's digit of the second number.

Case	**Description**	**Formula**
1	Ten's digit is same and one's digit add to 10	n1*(n1+1)*100+m1*m2
2	Ten's digits add to 10 and one's digit is same	(n1*n2+m1)*100+m1*m1

[1]If neither of the cases is true then our method fails
[2]CAUTION:If on multiplying we obtain a single digit then we should consider the second digit to be 0.

4.3.1 Case 1

As shown in algorithm**??**

$$\begin{aligned}
x * y &= (n1 * 10 + m1) * (n2 * 10 + m2) \\
&= n1 * n2 * 100 + m1 * n2 * 10 + m2 * n1 * 10 + m1 * m2 \\
&= n1 * n1 * 100 + (m1 + m2) * n1 * 10 + m1 * m2 && \text{n1=n2} \\
&= n1 * n1 * 100 + n1 * 100 + m1 * m2 && \text{m1+m2=10} \\
&= n1 * (n1 + 1) * 100 + m1 * m2
\end{aligned}$$

4.3.2 Case 2

As shown in algorithm**??**

$$\begin{aligned}
x * y &= (n1 * 10 + m1) * (n2 * 10 + m2) \\
&= n1 * n2 * 100 + n1 * m2 * 10 + n2 * m1 * 10 + m1 * m2 \\
&= n1 * n2 * 100 + (n1 + n2) * m1 * 10 + m1 * m1 && \text{m1=m2} \\
&= n1 * n2 * 100 + m1 * 100 + m1 * m1 && \text{n1+n2=10} \\
&= (n1 * n2 + m1) * 100 + m1 * m1
\end{aligned}$$

5 Generalisation

We can generalise it for the product of two n-digit numbers.

- Take two n-digit numbers.
- If first digits are same and the last (n-1) digits add to 10^{n} then
  - First 2 digits are given by the product of the n^{th} digits
  - remaining digits are given by the product of the resulting n-1 digit numbers
- If first n-1 digits add to 10^{n} and the last digits are same then
  - Last two digits are given by the product of the last digits
  - First digits are given by the product of the resulting n-1 digit numbers and adding the last digit to the product obtained
- Hence, the product is obtained