**ASSIGNMENT NUMBER**:

**PROBLEM STATEMENT**:

Program in C to Multiply two numbers using Russian Peasant’s Method.

**THEORY**: There are many other ways to multiply. One of these methods is often called **the Russian peasant algorithm**. We don't need multiplication facts to use the Russian peasant algorithm; we only need to double numbers, divide them in half, and add them up. Here are the rules:

* Write each number at the head of a column.
* Double the number in the first column, and halve the number in the second column.  
  If the number in the second column is odd, divide it by two and drop the remainder.
* If the number in the second column is even, cross out that entire row.
* Keep doubling, halving, and crossing out until the number in the second column is 1.
* Add up the remaining numbers in the first column. The total is the product of your original numbers.

Example: Let’s multiply 9 x 8 with the Russian peasant’s method.

|  |  |
| --- | --- |
| ~~9~~ | ~~8~~ |
| ~~18~~ | ~~4~~ |
| ~~36~~ | ~~2~~ |
| 72 | 1 |

Hence the Result of Multiplication is 72.

**ALGORITHM:**

**Input:** The two numbers that is to be multiplied, say variable ‘a’ and ‘b’.

**Output:** The sum and result of the multiplication of ‘a’ and ‘b’.

**Steps:**

Step 1: Set loop = True

Step 2: Repeat through step 3 to 30 while(loop = True)

Step 3: Print "Enter two integers : "

Step 4: Input a, b

Step 5: If(a < 1 Or b < 1)

Then

Step 6: Print "Invalid input!”

[End of if structure]

Step 7: Print "Peasant Multiplication Method as follows”

Step 8: Set i = 0

Step 9: Set d = a

Step 10: Set e = b

Step 11: Repeat through step 12 to 19 While(d > 0)

Step 12: If(d mod 2 = 0)

Then

Step 13: Print d " " e " x(struck of)

Step 14: Else

Step 15: Print d " " e

Step 16: Set n[i] = e

Step 17: Set i = i + 1

[End of if structure]

Step 18: Set d = d/2

Step 19: Set e = e\*2

[End of while loop]

Step 20: Set s = n[1]

Step 21: Print “s”

Step 22: Set d = 2

Step 23: Repeat through step 24 to 26 while(d < i)

Step 24: Print " + " n[d]

Step 25: Set s = s+n[d]

Step 26: Set d = d+1

[End of while loop]

Step 27: Print " = " s

Step 28: Print " which is equal to " a " \* " b " = " a\*b

Step 29: Print "Do you want to continue (y/n) ? "

Step 30: Input ch

Step 31: If(ch != "Y" And ch != "y")

Then

Step 32: Set loop = False

[End of if structure]

**[End of while loop]**

**SOURCE CODE:**

#include <stdio.h>

int main(){

int a, b, d, p, n[20], s, i;

char ch = 'Y';

do{

printf("\nEnter the two numbers : ");

scanf("%d%d", &a, &b);

printf("\nPeasant Multiplication Method as follows : ");

i = 0;

for(d = a, p = b;d > 0;d = d/2, p = p\*2){

if(d % 2 == 0)

printf("\n\n%3d\t\t%3d x(struck of)", d, p);

else{

printf("\n\n%3d\t\t%3d", d, p);

n[i++] = p;

}

}

s = n[0];

printf("\n\n %d", n[0]);

for(d = 1;d < i;d++){

s = s + n[d];

printf(" + %d", n[d]);

}

printf(" = %d", s);

printf(" which is equal to %d \* %d = %d", a, b, (a\*b));

printf("\nDo you want to continue (y/n) ? ");

scanf(" %c", &ch);

} while(ch == 'Y' || ch == 'y');

return 0;

}

**INPUT AND OUTPUT:**

**SET 1:** Enter the two number: 11 15 Peasant multiplication method as Follows: 11 15

5 20

2 60 X( struck off)

1 20

15+ 30+ 120= 165 Which is equals to 11 \* 15 = 165 Do you want to continue(Y/N)?y

**SET 2**: Enter the two number: 12 13 Peasant multiplication method as Follows: 12 13 X( struck off)

6 26 X( struck off)

3 52

1 104

52+ 104= 156 Which is equals to 12 \* 13 = 156 Do you want to continue(Y/N)?n

**DISCUSSION:**

1) The Program could be simplified and made more efficient if array isn’t used for storing summation value, Hence saving time and memory.

2) Since it depends on user what numbers he will give to multiply, so either for bigger or smaller numbers we have to specify an array with 20 memory locations. For smaller numbers many of the memory locations aren’t used.