

# Problem A

## The Unreal Tournament

**Input:** Standard Input

**Output:** Standard Output

**Time Limit:** 20 seconds

In this particular problem, **The Unreal Tournament** is a tournament, which consists of only two teams. Let these two teams be **Abahoni** and **Mohamedan**. They play in between them not more than  $2n-1$  games, the winner being the first team to achieve  $n$  victories. You can assume that there are no tied games, the result of each game is independent and for any match there is a constant probability  $p$  that team **Abahoni** will win and hence there is a constant probability  $q=1-p$  that team **Mohamedan** will win.

$P(i,j)$  is the probability that team **Abahoni** will win the series given that they still need  $i$  more victories to achieve this, whereas team **Mohamedan** still need  $j$  more victories if they are to win. The  $P(i,j)$  can be computed with a function like the following

**Function  $P(i,j)$**

**if  $i = 0$  then return 1**

**else if  $j = 0$  then return 0**

**else return  $pP(i-1,j) + qP(i,j-1)$**

You will have to write a program that gives the probability of winning for any  $p$ ,  $i$  and  $j$  and also gives the number of recursive calls required if the function above is used to get the probability  $P(i,j)$ .

## Input

The input file contains several sets of input. The first line of a set contains one floating-point number  $p$  ( $0 < p < 1$ ), and an integer  $N$  ( $0 \leq N < 1001$ ) where  $p$  is the winning probability of Abahoni and  $N$  is the number queries to follow. Each of the next  $N$  lines contains two integers  $i$  ( $0 \leq i \leq 1000$ ) and  $j$  ( $0 \leq j \leq 1000$ ). Input is terminated by a set, which has zero as the value of  $N$ . This set should not be processed.

## Output

For each query you should print two lines. The first line contains the value of  $P(i,j)$  with five digits after the decimal and the second line contains a round number which is the number of recursive calls needed if the function mentioned above was used to determine the value of  $P(i,j)$ . If the value of  $P(i,j)$  is undefined you should print -1 as its value with similar formatting. A blank line should be printed between the outputs of two consecutive sets.

## Sample Input:

0.5 3  
1 1  
2 2  
3 3  
0.5 2  
10 3  
10 2  
0.7 0

### **Sample Output:**

0.50000  
2  
0.50000  
10  
0.50000  
38

0.01929  
570  
0.00586  
130

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