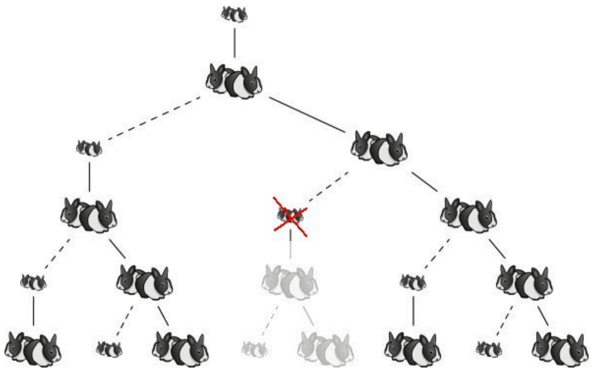
3 The famous Fibonacci number can be used to represent the population growth of pairs of rabbits as shown in the Figure. Each pair of small rabbits took one year to grow to mutuality and it took one more year for them to start producing offspring. After that, the mutuality will produce one pair of offspring every year after. Thus, we have the formula for Fibonacci numbers follows:

$$f(n) = \begin{cases} 1, & \text{if } n = 0 \text{ or } n = 1 \\ f(n-1) + f(n-2), & \text{if } n \geq 2 \end{cases}$$



The recursive formula shown above assumes that a pair of rabbits can live forever and keep on producing small rabbits each year. However, if some pairs of rabbits died during the years, the total rabbit population at year n will be less than $f(n)$.

Given that there are M pairs of rabbits left at year N, we what to know what is the minimum number of rabbit pairs dead in order to result in such ending population?

Input

The input contains two integer N, M separated with one space. ($N \leq 25$, $M \leq f(N)$)

Output

The output should contains one single integer K representing the minimum number of pairs had dead in order to result in the population M at year N. Note that in the above figure, only one pair has died because their offspring were never be born.

Example 1

```
Input:
5 6
Output:
1
```

Example 2

```
Input:
6 4
Output:
2
```

4 In Mathematics, there are many interesting problems that relate to integer power which can only be solved by computer. The least integer power problem is an example of this kind.

For a given integer B, try to find the smallest integer power P such that the last N digit of B^P is exactly Q. The key for a good solution for such kind of problem is speed!

Input

Each input data set contains a few lines. The first line contains two integers R and N. R represents the number of cases in this data set and N represents the number of digits in the result that we are interested in.

Then, it followed by R lines, each line contains two integers B and Q. Q is an N digits integer. Each line indicates that we want to know what is the smallest integer P (a value to be found) such that the last N digits in B^P is exactly Q.

Output

The output should contains R lines, each line contains an integer Q which corresponding to the answer to one case in the input data in the same order. If it is impossible to obtain Q from B^P, then the corresponding output should be 0.

For all test data, we always have $P \leq 1,000,000,000$, $R \leq 5,000$ and $N \leq 9$.

Example

```
Input:
4 3
3 027
31 361
11 234
123 561

Output:
3
32
0
56
```

For the above example, we have:

(a) $3^3 = 27$

(b) $31^{32} = 529144398052420314716929933900838757437386767361$ (where the last 3 digit is 361). Note that we don't need the whole number, just knowing the last 3 digits is good enough to solve this problem

(c) for 11^P, it is impossible to have result end with 234, and

(d) for the last case, $123^{56} = \cdots 55542561$ with the last 3 digit is 561.