ACM-UCLA Programación Creativa 2011
Practice Two Programming Contest

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Contest session

This problem set contains 8 problems; pages are numbered from 1 to 8.

Problem A
Afternoon

Source file name: `afternoon.c`, `afternoon.cpp` *or* `afternoon.java`
You must read from standard input and write to standard output.

Thursday afternoon, my friends, the clouds stop the sun from being seen, while the sweet rain gently wets the grass and shows to us a delicate feeling of peace and loneliness. Hours seem longer, that never end, someone might say; while people watch the gray and cold water falling from the sky, their minds are left to carry away.

To pass the time around this day, Justin and John play a new game. They have a stack of n stones; Justin plays first, next John, and then Justin again, and so on, until the game ends. The game goes like this, in each turn the player must take one of the stones and remove from the stack, next the other player takes his turn. If there's no stone to take, then the player lose.

Given that you're aware of the number of stones, who would win?

Input
There are several cases, each in a line with the number of stones n, where $1 \leq n \leq 10^{18}$. The input ends with $n = 0$, this case shouldn't be processed.

Output
For each case, print in a line the name of the player who wins the game.

Sample input
```
1  3
2  8
3  0
4
```

Sample output
```
1  Justin
2  John
3
```

Problem B

Be Free

Source file name: `bf.c`, `bf.cpp` *or* `bf.java`
You must read from standard input and write to standard output.

One group of undesirable people invaded the ACM headquarters in ALCU university. You must help the real members of ACM to deprive these people and be free. How could you help? You must do some calculations on numbers, emulating the "Not Operation", for example, if you have N = 357, this number in binary is 101100101 and if you convert all the 0s to 1s and the 1s to 0s, then you have 010011010. Additionally, you must remember that for the operation there is a bit that handles the number sign, and the real result, for a 64-bit integer, is 1111111111111111111111111111111111111111111111111111111010011010, and this number in decimal is -358.

Input

You will have an integer P indicating the number of test cases, and each of the following P lines contains a 64-bit signed integer N.

Output

You must print the result of the operation converted to decimal.

Sample input

```
1    1
2    357
3
```

Sample output

```
1    -358
2
```

Problem C
California Dreamin'

Source file name: `california.c`, `california.cpp` *or* `california.java`
You must read from standard input and write to standard output.

Another sunny day in California, ladies and gentleman, that's the way it looks like, until some stranger brought you an interesting problem.

You are given a string S, and you can make a single type of operation to it, L(S) which moves the first character to the end, for example, if S = abcdef, then after you made the operation then you get L(S) = bcdefa. We can even still doing this multiple times, so we can get L(L(S)) = cdefab, L(L(L(S))) = defabc, etc.

Now the problem is, given that we may make an arbitrary number of operations, which of all of them comes alphabetically first? By example, let's suppose that S = dagacn. After we made the operations we can get:

<div align="center">

dagacn
agacnd
gacnda
acndag
cndaga
ndagac

</div>

In this case, the fourth string is who comes first if we sort them alphabetically.

Input
The input consists of several cases, each in a line and contains a string S of no more than 25.000 lowercase letters. The last case is followed by the line '#' (without the quotes.)

Output
You must print the string that comes alphabetically first after we make zero or more times the operation to S as described before.

Sample input
```
1   dagacn
2   #
3
```

Sample output
```
1   acndag
2
```

Problem D

Determine the Polynomial

Source file name: `determine.c`*,* `determine.cpp` *or* `determine.java`
You must read from standard input and write to standard output.

Your task consists of evaluate a polynomial of degree n, between 0 and 999 represented by its $n + 1$ coefficients of the form:

$$P_n(x) = c_n x^n + c_{n-1} x^{n-1} + \cdots + c_2 x^2 + c_1 x + c_0$$

In each one of the k $(1 \le k \le 100)$ points, $x_1, x_2, \ldots, x_k$. The coefficients of the polynomial and the values where they will be evaluated are integers in the interval [-100, 100] that guarantees that the polynomial's evaluation is at most $2^{63} - 1$.

Input

There will be multiple test cases, each one with 4 lines that are described below:
n : Degree of polynomial.
$c_n\ c_{n-1}\ \ldots\ c_2\ c_1\ c_0$: Coefficients of the polynomial; separated by a single space.
k : Number of points to evaluate the polynomial.
$x_1\ x_2\ \ldots\ x_{k-1}\ x_k$: Points to evaluate the polynomial; separated by a single space.

The final test case is a single line where $n = -1$ and this case should not be processed.

Output

For each test case you should print $k + 1$ lines of output, the very first line containing the case number and the following k lines with the result of the polynomial's evaluation in each one of the k given points. See the sample.

Sample input	Sample output
1 2	1 Case 1:
2 1 -2 -1	2 -1
3 5	3 -2
4 0 1 -1 2 -2	4 2
5 3	5 -1
6 2 1 -2 -1	6 7
7 4	7 Case 2:
8 0 -1 2 -2	8 -1
9 -1	9 0
10	10 15
	11 -9
	12

Problem E

Evening

Source file name: `evening.c`, `evening.cpp` *or* `evening.java`
You must read from standard input and write to standard output.

The rain has long gone, while the twilight time is brought to us. Few hours left for the day comes to end, see the sun disappear in all of his glory around the skyline.

Just to pass the time, Justin told to John about a new problem, he would give him N integers A_i, $1 \le i \le N$, and several queries. John had to say, for each query q how many numbers A_i are less or equal to q. John asked for your help.

Input

There're three lines for each case, the first has two positive integers N and Q ($N, Q < 10^6$), the number of integers and queries given, the next line has N integers A_i, $0 \le A_i \le 10^6$. The third line contains Q integers, each describe a query. The input ends with $N = Q = 0$, this case shouldn't be processed.

Output

For each case, print one line with Q integers, which are the answers to each query, in the same order, and separated by one whitespace.

Sample input

```
4 2
1 2 3 4
2 7
```

Sample output

```
2 4
```

Problem F
Factorial: Just Kidding

Source file name: `fjk.c`, `fjk.cpp` *or* `fjk.java`
You must read from standard input and write to standard output.

The Fibonacci numbers is a sequence described as follows:

$$F_n = F_{n-1} + F_{n-2}$$

$$F_0 = 0$$

$$F_1 = 1$$

But in this problem, the Fibonacci numbers are evil. You must calculate the Fibonacci number and write it in terms of count of the digits 0 to 9. For example, $F_{12} = 144$, and you can write it as one digit 1 and two digits 4.

Input

The input has an integer N per line. You can be sure that the result of calculation of the number fits in a 64-bit integer. Input ends with an EOF marker.

Output

Print one line for each test case, with the required number expressed in digits from 0 to 9. You should see the sample output for the format that will be printed.

Sample input

```
1   8
2   0
3   12
4
```

Sample output

```
1   0 (0) 1 (1) 2 (1) 3 (0) 4 (0) 5 (0) 6 (0) 7 (0) 8 (0) 9 (0)
2   0 (1) 1 (0) 2 (0) 3 (0) 4 (0) 5 (0) 6 (0) 7 (0) 8 (0) 9 (0)
3   0 (0) 1 (1) 2 (0) 3 (0) 4 (2) 5 (0) 6 (0) 7 (0) 8 (0) 9 (0)
4
```

Problem G

Game with Math

Source file name: `game.c`, `game.cpp` *or* `game.java`
You must read from standard input and write to standard output.

Sasha the girl who crash with the light post, has challenged to an Emo boy to the following game: The boy has a board with dots marked at N ($2 \leq N \leq 200$) distinct lattice points. Dot i has the integer coordinates X_i and Y_i ($-1{,}000 \leq X_i, Y_i \leq 1{,}000$).

Sasha can score a point in the game by picking two of the dots and drawing a straight line between them; however, she is not allowed to draw a line if she has already drawn another line parallel to it. Sasha would like to know her chances of winning, so she has asked you to help find the maximum score she can obtain.

Input

There will be multiple test cases. For each case, the first line contains the integer N, and each of the next N lines gives a pair of integers, X_i and Y_i. The input ends with the case $N = 0$, which should not be processed.

Output

For each test case, print a single integer representing the maximum number of lines Sasha can draw, no two of which are parallel.

Sample input

```
1   4
2   -1 1
3   -2 0
4   0 0
5   1 1
6   0
7
```

Sample output

```
1   4
2
```

Problem H

Hazard People

Source file name: `hazard.c`*,* `hazard.cpp` *or* `hazard.java`
You must read from standard input and write to standard output.

Tom Clancy and 40 fellow rebels were trapped by the Al-Qaeda. His companions preferred suicide to surrender, so they decided to form a circle and to kill every third person and to proceed around the circle until no one was left. Tom Clancy was not excited by the idea of killing himself, so he calculated the position to be the last man standing (and then he did not commit suicide since nobody could watch).

We will consider a variant of this "game" where every second person leaves. And of course there will be more than 41 persons, for we now have computers. You have to calculate the safe position. Be careful because we might apply your program to calculate the winner of this contest!

Input

The input contains several test cases. Each specifies a number n, denoting the number of persons participating in the game. To make things more difficult, it always has the format "$xyez$" with the following semantics: when n is written down in decimal notation, its first digit is x, its second digit is y, and then follow z zeros. Whereas $0 \leq x, y \leq 9$, the number of zeros is $0 \leq z \leq 6$. You may assume that $n > 0$. The last test case is followed by the string $00e0$.

Output

For each test case, generate a line containing the position of the person who survives. Assume that the participants have serial numbers from 1 to n and that the counting starts with person 1, i.e., the first person leaving is the one with number 2. For example, if there are 5 persons in the circle, counting proceeds as 2, 4, 1, 5 and person 3 is staying alive.

Sample input

```
1   05e0
2   01e1
3   42e0
4   66e6
5   00e0
6
```

Sample output

```
1   3
2   5
3   21
4   64891137
5
```