

Angie and Functions

Time limit: 1.8s **Memory limit:** 256M

Angie is studying functions!

For her homework, she was asked to figure out the coefficients $c_1, c_2, \dots, c_N, c_{N+1}$ in the following function:

$$f(x) = c_1x^N + c_2x^{N-1} + \dots + c_Nx + c_{N+1} \text{ (All the coefficients are integers)}$$

To assist her on this question, her math teacher has allowed her to ask queries in the following form:

Given an integer x , what is $f(x)$?

However, as he doesn't want to give her too many hints, she can only make up to Q queries.

Angie has just started the year and isn't sure how to approach the problem. Can you help her solve it?

Not only will the answers to your queries be given modulo $10^9 + 7$, your output should be modulo $10^9 + 7$ as well.

Constraints

For all subtasks:

$$Q = 2100$$

$$1 \leq N \leq 2000$$

$$-10^9 \leq c_1, c_2, \dots, c_N, c_{N+1} \leq 10^9$$

$$0 \leq x < 10^9 + 7$$

Subtask 1 [5%]

$$-5 \leq c_1, c_2, \dots, c_N, c_{N+1} \leq 5$$

$$N = 1$$

Subtask 2 [10%]

$$-5 \leq c_1, c_2, \dots, c_N, c_{N+1} \leq 5$$

$$N \leq 3$$

Subtask 3 [15%]

$$N \leq 500$$

Subtask 4 [70%]

No additional constraints.

Interaction

The first and only line of input will be the integer N .

After that, you will begin interaction.

To make a query, output `? x` where `x` is an integer that satisfies the constraints for x given above ($-10^9 \leq x \leq 10^9$).

Then, you will receive an integer denoting the value of $f(x)$. If at any point you make an invalid query, exceed the maximum query count, or give an x that is out of the limits you will receive $10^9 + 7$ instead. It's guaranteed that $0 \leq f(x) < 10^9 + 7$ for any valid x .

Once you've completed the problem, output your answer in the form `! c_1 c_2 ... c_N c_{N+1}`, where $c_1, c_2, \dots, c_N, c_{N+1}$ are the coefficients in $f(x)$. *The interactor will give no further output at this point.*

Important Notes/Reminders

- **All input and output will be modulo $10^9 + 7$. Be careful of how modulo works with negative numbers (e.g. $-4 \bmod (10^9 + 7) = 1\,000\,000\,003$).**
- **Always flush after writing to standard output.**
- **If you ever receive $10^9 + 7$ as input, make sure to terminate the program (e.g. `exit(0);` in C++). Otherwise, you will receive TLE instead of WA.**

Sample Interaction

Note the following:

- The sample case here is $N = 3$ where $c_1 = 5, c_2 = -4, c_3 = 2, c_4 = 1$.
- `>>>` denotes your output. Do not actually print `>>>`.

```
3
>>> ? 3
106
>>> ? 5
536
>>> ? 1000000004
999999831
>>> ! 5 1000000003 2 1
```

Note the following:

- The answers are outputted modulo $10^9 + 7$.
- `? 1000000004` is the equivalent of asking for $f(-3)$. $f(-3) = -176$ and $-176 \bmod (10^9 + 7) = 999\,999\,831$.