Fourier Coefficients

Input file:	`standard input`
Output file:	`standard output`
Time limit:	8 seconds
Memory limit:	1024 megabytes

This is an **interactive problem**. Your program will interact with the judge via standard input and output. The judge's execution may take up to 1.3 seconds.

You are given an integer N. The judge secretly chooses a function

$$f(x) := \sum_{k=0}^{N-1} A_k \cos(kx),$$

where each $A_0, A_1, \ldots, A_{N-1}$ is an integer with $0 \le A_k < 998244353$.

You must determine the values of $A_0, A_1, \ldots, A_{N-1}$ by interacting as described below:

You will output N pairs of integers $(X_1, Y_1), \ldots, (X_N, Y_N)$. Each pair must satisfy

$$0 \le X_i \le Y_i < 998244353, \quad Y_i \neq 0.$$

The judge will then respond with N integers $Z_1, \ldots, Z_N$, where

$$Z_i \;=\; f\big(\arccos(X_i/Y_i)\big) \bmod 998244353.$$

Detailed definition of Z_i. Under the constraints on X_i, Y_i, the value $f(\arccos(X_i/Y_i))$ is a rational number. Write it in lowest terms as P_i/Q_i; one can show $Q_i \not\equiv 0 \pmod{998244353}$. Then Z_i is defined to be the unique integer $0 \le Z_i < 998244353$ satisfying

$$Z_i\, Q_i \;\equiv\; P_i \pmod{998244353}.$$

Such a Z_i always exists and is unique.

Input

- All inputs are integers.
- $1 \le N \le 5 \times 10^5$.

Interaction Protocol

This is an interactive problem. Your program will interact with the judge via standard input and output.

First, read the integer N from standard input:

```
N
```

Then output N query pairs (X_i, Y_i) in the following format, satisfying the constraints above:

```
X_1 Y_1
X_2 Y_2
⋮
X_N Y_N
```

If your output is valid, the judge will reply with N lines:

Z_1
Z_2
$\vdots$
Z_N

If your output is invalid, you will receive:

```
-1
```

If you receive "`-1`", your program must terminate immediately.

Finally, after receiving the Z_i, output the hidden coefficients $A_0, A_1, \ldots, A_{N-1}$ in order:

A_0
A_1
$\vdots$
A_{N-1}

Note

- **After every output operation, print a newline and flush standard output.** If you fail to flush, you may receive a TLE verdict.
- If you produce an invalid output at any point or your program terminates unexpectedly, the verdict is undefined.
- Immediately terminate your program after printing the answer (or after reading "`-1`"). Otherwise, the verdict is undefined.
- Extra newlines or any deviation from the specified format will be judged as invalid.
- The judge is non-adaptive: the values $A_0, \ldots, A_{N-1}$ are fixed at the start and do not change during the interaction.

Example

Suppose $N = 2$ and $(A_0, A_1) = (3, 2)$. A possible interaction is shown below.

Input	Your Output	Explanation
`2`		You read N.
	`0 1` `1 1`	You query two valid pairs (X_i, Y_i).
`3` `5`		The judge returns $Z_1 = 3$, $Z_2 = 5$.
	`3` `2`	You output the recovered (A_0, A_1).