

## D. Ceil Divisions

time limit per test: 2 seconds

memory limit per test: 256 megabytes

input: standard input

output: standard output

You have an array  $a_1, a_2, \dots, a_n$  where  $a_i = i$ .

In one step, you can choose two indices  $x$  and  $y$  ( $x \neq y$ ) and set  $a_x = \left\lceil \frac{a_x}{a_y} \right\rceil$  (ceiling function).

Your goal is to make array  $a$  consist of  $n - 1$  ones and 1 two in no more than  $n + 5$  steps. Note that you don't have to minimize the number of steps.

### Input

The first line contains a single integer  $t$  ( $1 \leq t \leq 1000$ ) — the number of test cases.

The first and only line of each test case contains the single integer  $n$  ( $3 \leq n \leq 2 \cdot 10^5$ ) — the length of array  $a$ .

It's guaranteed that the sum of  $n$  over test cases doesn't exceed  $2 \cdot 10^5$ .

### Output

For each test case, print the sequence of operations that will make  $a$  as  $n - 1$  ones and 1 two in the following format: firstly, print one integer  $m$  ( $m \leq n + 5$ ) — the number of operations; next print  $m$  pairs of integers  $x$  and  $y$  ( $1 \leq x, y \leq n$ ;  $x \neq y$ ) ( $x$  may be greater or less than  $y$ ) — the indices of the corresponding operation.

It can be proven that for the given constraints it's always possible to find a correct sequence of operations.

### Example

input	Copy
2 3 4	
output	Copy
2 3 2 3 2 3 3 4 4 2 4 2	

### Note

In the first test case, you have array  $a = [1, 2, 3]$ . For example, you can do the following:

- choose 3, 2:  $a_3 = \left\lceil \frac{a_3}{a_2} \right\rceil = 2$  and array  $a = [1, 2, 2]$ ;
- choose 3, 2:  $a_3 = \left\lceil \frac{2}{2} \right\rceil = 1$  and array  $a = [1, 2, 1]$ .

You've got array with 2 ones and 1 two in 2 steps.

In the second test case,  $a = [1, 2, 3, 4]$ . For example, you can do the following:

- choose 3, 4:  $a_3 = \left\lceil \frac{3}{4} \right\rceil = 1$  and array  $a = [1, 2, 1, 4]$ ;
- choose 4, 2:  $a_4 = \left\lceil \frac{4}{2} \right\rceil = 2$  and array  $a = [1, 2, 1, 2]$ ;
- choose 4, 2:  $a_4 = \left\lceil \frac{2}{2} \right\rceil = 1$  and array  $a = [1, 2, 1, 1]$ .

### Educational Codeforces Round 101 (Rated for Div. 2)

**Finished**

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brute force constructive algorithms  
math number theory \*1700  
No tag edit access

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- Announcement
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