

---

## P0017. Siracusa attacks again

P14410\_en

---

Being  $n$  a natural number greater than zero. Consider this algorithm:

- If  $n = 1$ , stop.
- If  $n$  is an even number, divide it by 2.
- If  $n$  is an odd number, multiply it by 3 and add 1.

For instance, starting with 6 we obtain  $6 \rightarrow 3 \rightarrow 10 \rightarrow 5 \rightarrow 16 \rightarrow 8 \rightarrow 4 \rightarrow 2 \rightarrow 1$ .

The conjecture  $3n + 1$  says that starting with any natural number  $n > 0$ , it always arrives to 1. Although it has not still been proved, using computers we know that is true for numbers  $n \leq 4035225266123964416$ .

Your task is to write a program that reads two natural numbers  $m$  and  $p$  and prints which natural numbers between 1 and  $m$  arrive to 1 in  $p$  or more steps. It must print also which is the greatest number contained in their steps.

Your program must implement and use the procedure

```
void converge(int n, int& k, int& far);
```

that, given an integer strictly positive  $n$ , stores at the parameter  $k$  the number of steps that needs  $n$  to arrive to 1, and at the parameter  $far$  the greatest number seen in the process. For instance, `converge(6, k, far);` stores an 8 at  $k$  and a 16 at  $far$ . Similarly, `converge(4, k, far);` stores a 2 at  $k$  and a 4 at  $far$ , and `converge(1, k, far);` stores a 0 at  $k$  and an 1 at  $far$ .

### Input

The input is two natural numbers  $m$  and  $p$ , with  $1 \leq m \leq 50000$ .

### Output

Your program must print all the numbers between 1 and  $m$  that arrive to 1 in  $p$  or more steps, one per line. Besides, print also the greatest produced number, following the format of the instances.

### Sample input 1

6 7

### Sample input 2

16 0

### Sample input 3

1 0

### Sample input 4

2 1

### Sample input 5

30 200

### Sample input 6

50000 323

### Sample input 7

447 140

### Sample output 1

```
3
6
The greatest reached number is 16.
```

### Sample output 2

```
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
The greatest reached number is 160.
```

### Sample output 3

```
1
The greatest reached number is 1.
```

### Sample output 4

```
2
The greatest reached number is 2.
```

### Sample output 5

```
The greatest reached number is 9232.
```

### Sample output 6

```
35655
The greatest reached number is 121012864.
```

### Sample output 7

```
327
The greatest reached number is 39364.
```

### Problem information

Author : Professorat de P1  
Translator : Carlos Molina  
Generation : 2023-07-14 17:43:37

© *Jutge.org*, 2006–2023.  
<https://jutge.org>