E. Polo the Penguin and XOR operation

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Little penguin Polo likes permutations. But most of all he likes permutations of integers from 0 to n, inclusive.

For permutation $p = p_0, p_1, ..., p_n$, Polo has defined its beauty — number .

Expression means applying the operation of bitwise excluding "OR" to numbers x and y. This operation exists in all modern programming languages, for example, in language *C++* and *Java* it is represented as "^" and in *Pascal* — as "`xor`".

Help him find among all permutations of integers from 0 to n the permutation with the maximum beauty.

Input

The single line contains a positive integer n ($1 \le n \le 10^6$).

Output

In the first line print integer m the maximum possible beauty. In the second line print any permutation of integers from 0 to n with the beauty equal to m.

If there are several suitable permutations, you are allowed to print any of them.

Examples

input
4

output
20 0 2 1 4 3