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Addition Chains

Time Limit: 1000MS

Memory Limit: 65536K

Total Submissions: 5277

Accepted: 2834

Special Judge

Description

An addition chain for n is an integer sequence with the following four properties:

- $a_0 = 1$
- $a_m = n$
- $a_0 < a_1 < a_2 < \dots < a_{m-1} < a_m$
- For each k ($1 \leq k \leq m$) there exist two (not necessarily different) integers i and j ($0 \leq i, j \leq k-1$) with $a_k = a_i + a_j$

You are given an integer n . Your job is to construct an addition chain for n with minimal length. If there is more than one such sequence, any one is acceptable. For example, $\langle 1, 2, 3, 5 \rangle$ and $\langle 1, 2, 4, 5 \rangle$ are both valid solutions when you are asked for an addition chain for 5.

Input

The input will contain one or more test cases. Each test case consists of one line containing one integer n ($1 \leq n \leq 100$). Input is terminated by a value of zero (0) for n .

