

Special Numbers

Ted thinks that integers having equal number of 1's and 0's in their binary representation are special. Therefore, he wants to know how many such integers are present.

Note: For this problem, the binary representation of an integer(>0) is considered from the least significant bit to the last set bit. Which means, 5 has a binary representation of 101, 3 has a binary representation of 11 etc. As such, one example of a special number is 9 which has a binary representation, 1001.

Input

First line contains an integer T (at most 100) denoting the total number of test cases. Each test case contains a single integer N ($2 \leq N \leq 2^{60}$). N is always a power of 2.

Output

A single integer denoting the total number of such special numbers in the range 1 to N (inclusive).

Example

Input:

3
8
16
32

Output:

1
4
4