Paying in Byteland

There are infinitely many coin denominations in the Byteland. They have values of 2^i for i=0,1,2,... . We will say that set of coins c1,c2,...,ck is perfect when it is possible to pay every amount of money between 0 and c1+...+ck using some of them (so {4,2,2,1} is perfect while {8,1} is not). The question is - is it always possible to change given sum n into a perfect set of coins? Of course it is possible ;). Your task will be more complicated: for a sum n you should find minimal number of coins in its perfect representation.

Input

First line of input contains one integer c<=50 - number of test cases. Then c lines follow, each of them consisting of exactly one integer n<=10^1000.

Output

For each test case output minimal number of coins.

Example

Input:
5
507
29
8574
233
149

Output:
14
7
21
11
10