Starting with x and repeatedly multiplying by x, we can compute x^{31} with thirty multiplications:

$$x^2 = x \times x, \quad x^3 = x^2 \times x, \quad x^4 = x^3 \times x, \quad \ldots, \quad x^{31} = x^{30} \times x.$$

The operation of squaring can appreciably shorten the sequence of multiplications. The following is a way to compute x^{31} with eight multiplications:

$$x^2 = x \times x, \quad x^3 = x^2 \times x, \quad x^6 = x^3 \times x^3, \quad x^7 = x^6 \times x, \quad x^{14} = x^7 \times x^7,$$
$$x^{15} = x^{14} \times x, \quad x^{30} = x^{15} \times x^{15}, \quad x^{31} = x^{30} \times x.$$

This is not the shortest sequence of multiplications to compute x^{31}. There are many ways with only seven multiplications. The following is one of them:

$$x^2 = x \times x, \quad x^4 = x^2 \times x^2, \quad x^8 = x^4 \times x^4, \quad x^{10} = x^8 \times x^2,$$
$$x^{20} = x^{10} \times x^{10}, \quad x^{30} = x^{20} \times x^{10}, \quad x^{31} = x^{30} \times x.$$

There however is no way to compute x^{31} with fewer multiplications. Thus this is one of the most efficient ways to compute x^{31} only by multiplications.

If division is also available, we can find a shorter sequence of operations. It is possible to compute x^{31} with six operations (five multiplications and one division):

$$x^2 = x \times x, \quad x^4 = x^2 \times x^2, \quad x^8 = x^4 \times x^4, \quad x^{16} = x^8 \times x^8, \quad x^{32} = x^{16} \times x^{16}, \quad x^{31} = x^{32} \div x.$$

This is one of the most efficient ways to compute x^{31} if a division is as fast as a multiplication.

Your mission is to write a program to find the least number of operations to compute x^n by multiplication and division starting with x for the given positive integer n. Products and quotients appearing in the sequence of operations should be x to a positive integer's power. In other words, x^{-3}, for example, should never appear.

Input

The input is a sequence of one or more lines each containing a single integer n. n is positive and less than or equal to 1000. The end of the input is indicated by a zero.

Output

Your program should print the least total number of multiplications and divisions required to compute x^n starting with x for the integer n. The numbers should be written each in a separate line without any superfluous characters such as leading or trailing spaces.

Sample Input

```
1
31
70
91
473
512
811
953
0
```

Sample Output

```
0
6
8
9
11
9
13
12
```