

Power Calculus

<https://vjudge.csgrandeur.cn/problem/POJ-3134>

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

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

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

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

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:

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

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

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

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 should be x to a positive integer's power. In others 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	Output
1	0
31	6
70	8
91	9
473	11
512	9
811	13
953	12
0	