7766 Hamiltonian Hypercube

Hypercube graphs are fascinatingly regular, hence you have devoted a lot of time studying the mathematics related to them. The vertices of a hypercube graph of dimension n are all binary strings of length n, and two vertices are connected if they differ in a single position. There are many interesting relationships between hypercube graphs and error-correcting code.

One such relationship concerns the n-bit Gray Code, which is an ordering of the binary strings of length n, defined recursively as follows. The sequence of words in the n-bit code first consists of the words of the $(n-1)$-bit code, each prepended by a 0, followed by the same words in reverse order, each prepended by a 1. The 1-bit Gray Code just consists of a 0 and a 1. For example the 3-bit Gray Code is the following sequence:

000, 001, 011, 010, 110, 111, 101, 100

Now, the n-bit Gray Code forms a Hamiltonian path in the n-dimensional hypercube, i.e., a path that visits every vertex exactly once (see Figure H.1).

You wonder how many vertices there are between the vertices 0^n (n zeros) and 1^n (n ones) on that path. Obviously it will be somewhere between $2^{n-1}-1$ and 2^n-2, since in general 0^n is the first vertex, and 1^n is somewhere in the second half of the path. After finding an elegant answer to this question you ask yourself whether you can generalise the answer by writing a program that can determine the number of vertices between two arbitrary vertices of the hypercube, in the path corresponding to the Gray Code.

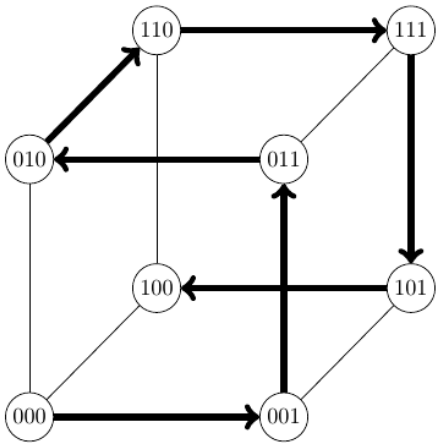

Figure H.1: The 3-dimensional hypercube and the Hamiltonian path corresponding to the 3-bit Gray Code.

Input

The input file contains several test cases, each of them as described below.

The input consists of a single line, containing:

- one integer n ($1 \leq n \leq 60$), the dimension of the hypercube.
- two binary strings a and b, both of length n, where a appears before b in the n-bit Gray Code.

Output

For each test case, output on a line by itself, the number of code words between a and b in the n-bit Gray Code.

Sample Input

```
3 001 111
3 110 100
```

Sample Output

```
3
2
```