

## Problem J. Best Carry Player 3

Input file:            standard input  
Output file:           standard output  
Time limit:            1 second  
Memory limit:         1024 megabytes

After learning the bitwise XOR operation, Little Cyan Fish would like to practice it by playing the following game.

Little Cyan Fish has an integer  $X$ . He wants to transform  $X$  into another integer  $Y$  using addition, subtraction, or bitwise XOR operations.

Because he is not a *Best Carry Player*, he cannot understand the operations of addition and subtraction between large numbers. Thus, he can only perform the following operations:

- (+): Change  $X$  to  $X + 1$ .
- (-): Change  $X$  to  $X - 1$ . This operation is not available if  $X = 0$ .
- ( $\oplus$ ): Choose an integer  $0 \leq t \leq K$ , change  $X$  to  $X \oplus t$ , where  $\oplus$  is the bitwise XOR operator.

Given integers  $X, Y$  and  $K$ , you need to calculate the minimum number of operations that Little Cyan Fish needs to perform to transform  $X$  into  $Y$ .

### Input

There are multiple test cases. The first line contains one integer  $T$  ( $1 \leq T \leq 10^5$ ), representing the number of test cases.

For each test case, the first line contains three integers  $X, Y$  and  $K$  ( $0 \leq X, Y, K < 2^{60}$ ).

### Output

For each test case, output a single line contains a single integer, indicating the minimum number of operations that Little Cyan Fish needs to perform.

### Example

standard input	standard output
8	1
4 5 0	2
5 8 3	3
9 2 6	5
15 28 5	11
97 47 8	6
164 275 38	331
114514 1919 810	1152921504606846975
0 1152921504606846975 1	

### Note

In the first test case, the optimal plan is:

- (+): Change  $X$  from 4 to  $4 + 1 = 5$ .

So the answer is 1.

In the second test case, the optimal plan is:

- $(\oplus 2)$ : Choose  $t = 2$ , change  $X$  from 5 to  $5 \oplus 2 = 7$ .
- $(+)$ : Change  $X$  from 7 to  $7 + 1 = 8$ .

So the answer is 2.

In the third test case, the optimal plan is:

- $(-)$ : Choose  $X$  from 9 to  $9 - 1 = 8$ .
- $(-)$ : Change  $X$  from 8 to  $8 - 1 = 7$ .
- $(\oplus 5)$ : Choose  $t = 5$ , Change  $X$  from 7 to  $7 \oplus 5 = 2$ .

So the answer is 3.