

## Meet The Gray Bits



The *reflected binary code* (RBC), a.k.a. the *Gray code* (GC) after *Frank Gray*, is an ordering of the binary numeral system such that two successive values differ in only one bit. Today, Gray codes are widely used to facilitate error correction in digital communications such as digital television, or in genetic algorithms due to the Hamming distance properties, since mutations in the code allow for mostly incremental changes, but occasionally a single bit-change can cause a big leap and lead to new properties. A GC for  $n$  bits is a sequence of  $2^n$  different  $n$ -bit integers with the property that every two neighbouring integers differ in exactly one bit.

The sequence of integers following the rules of GC can be generated by starting with a sequence of two bits

0  
1

and then reflected over the horizontal line, zero bit (0) is added to the beginning of the numbers in the top half and a one bit (1) to the numbers on the bottom to obtain a longer sequence

00  
01  
11  
10

Repeating this process again yields the sequence of length 8 provided below

000 → 0  
001 → 1  
011 → 3  
010 → 2  
110 → 6  
111 → 7  
101 → 5  
100 → 4

with the corresponding decimal values shown on the right.

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### Input

The first line of input gives the number of test cases,  $N$  (at most 250 000), then  $N$  test cases follow. Each one is a line with 2 integers:  $n$  ( $1 \leq n \leq 30$ ) and  $k$  ( $0 \leq k < 2^n$ ), separated by space.

### Output

For each test case, output the integer that appears in  $k$ -th position of the  $n$ -bit GC.

### Input sample

7  
1 0  
1 1  
2 3  
3 7  
4 15  
20 478  
30 1000000

### Output sample

0  
1  
2  
4  
8  
305  
582496