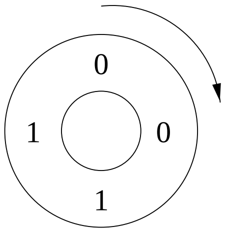
Ouroboros was a mythical snake in Ancient Egypt. It has its tail inside its mouth and continuously devours itself.

Ouroboros numbers are binary numbers of 2^n bits that have the property of generating the whole set of numbers from 0 to $2^n - 1$ as follows: To produce all of them we place the 2^n bits wrapped in a circle so that the last bit goes before the first one. Then we can denote all 2^n different strings with n bits starting each time with the next bit in the circle.

For example, for $n = 2$ there are only four Ouroboros numbers. These are 0011, 0110, 1100 and 1001. For 0011, the following diagram and table depicts the process of finding all the bitstrings:



k	**0011**0011...	$o(n=2,k)$
0	00	0
1	01	1
2	11	3
3	10	2

Your program will compute the function $o(n,k)$, where $n > 0$ and $0 \leq k < 2^n$. This function calculates the k-th number inside the smallest Ouroboros number of size n-bits.

Input

The input starts with a line containing the number of test cases. For each test case you will be given a line with two integers n ($0 < n < 22$) and k ($0 \leq k < 2^n$).

Output

For every test case your output must evaluate the function $o(n,k)$ and print the result on a line by itself.

Sample Input

```
4
2 0
2 1
2 2
2 3
```

Sample Output

```
0
1
3
2
```