# Day 6: Bitwise Operators ★

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10 Days of JS ★★★★

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**Objective**

Today, we're practicing bitwise operations. Check the attached tutorial for more details.

**Task**

We define $S$ to be a sequence of distinct sequential integers from $1$ to $n$; in other words, $S = \{1, 2, 3, \ldots, n\}$. We want to know the maximum bitwise AND value of any two integers, $a$ and $b$ (where $a < b$), in sequence $S$ that is also less than a given integer, $k$.

Complete the function in the editor so that given $n$ and $k$, it returns the maximum $a \,\&\, b < k$.

**Note:** The $\&$ symbol represents the bitwise AND operator.

**Input Format**

The first line contains an integer, $q$, denoting the number of function calls.

Each of the $q$ subsequent lines defines a dataset for a function call in the form of two space-separated integers describing the respective values of $n$ and $k$.

**Constraints**

- $1 \leq q \leq 10^3$
- $2 \leq n \leq 10^3$
- $2 \leq k \leq n$

**Output Format**

Return the maximum possible value of $a \,\&\, b < k$ for any $a < b$ in sequence $S$.

**Sample Input 0**

```
3
5 2
8 5
2 2
```

**Sample Output 0**

```
1
4
0
```

**Explanation 0**

We perform the following $q = 3$ function calls:

1. When $n = 5$ and $k = 2$, we have the following possible $a$ and $b$ values in set $S = \{1, 2, 3, 4, 5\}$:

| $a$ | $b$ | $a \,\&\, b$ |
|---|---|---|
| $1$ | $2$ | $001 \,\&\, 010 = (000)_2 \Rightarrow (0)_{10}$ |
| $1$ | $3$ | $001 \,\&\, 011 = (001)_2 \Rightarrow (1)_{10}$ |
| $1$ | $4$ | $001 \,\&\, 100 = (000)_2 \Rightarrow (0)_{10}$ |
| $1$ | $5$ | $001 \,\&\, 101 = (001)_2 \Rightarrow (1)_{10}$ |
| $2$ | $3$ | $010 \,\&\, 011 = (010)_2 \Rightarrow (2)_{10}$ |

| $a$ | $b$ | $a \,\&\, b$ |
|---|---|---|
| 2 | 4 | $010 \,\&\, 100 = (000)_2 \Rightarrow (0)_{10}$ |
| 2 | 5 | $010 \,\&\, 101 = (000)_2 \Rightarrow (0)_{10}$ |
| 3 | 4 | $011 \,\&\, 100 = (000)_2 \Rightarrow (0)_{10}$ |
| 3 | 5 | $011 \,\&\, 101 = (001)_2 \Rightarrow (1)_{10}$ |
| 4 | 5 | $100 \,\&\, 101 = (100)_2 \Rightarrow (4)_{10}$ |

The maximum of any $a \,\&\, b$ that is also $< k$ is $1$, so we return $1$.

2. When $n = 8$ and $k = 5$, the maximum of any $a \,\&\, b < k$ in set $S = \{1, 2, 3, 4, 5, 6, 7, 8\}$ is $4$ (see table above), so we return $4$.
3. When $n = 2$ and $k = 2$, the maximum of any $a \,\&\, b < k$ in set $S = \{1, 2\}$ is $0$ (see table above), so we return $0$.

**Sample Input 1**

```
2
9 2
8 3
```

**Sample Output 1**

```
1
2
```

**Explanation 1**

We perform the following $q = 2$ function calls:

1. When $n = 9$ and $k = 2$, the maximum of any $a \,\&\, b < k$ in set $S = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ is $1$ (see table above), so we return $1$.
2. When $n = 8$ and $k = 3$, the maximum of any $a \,\&\, b < k$ in set $S = \{1, 2, 3, 4, 5, 6, 7, 8\}$ is $2$ (see table above), so we return $2$.

Change Theme Language: JavaScript (Node.js)

```
19  });
20
21  function readLine() {
22      return inputString[currentLine++];
23  }
24
25  function getMaxLessThanK(n,k)
26  {
27      var max = 0
28      for(var i=1;i<n;i++)
29      for(var j=i+1;j<=n;j++)
30      {
31          var and = i&j
32
33          if(and<k && and>max)
34              max=and
35      }
36      return max
37  }
38
39  function main() {
40      const q = +(readLine());
41
42      for (let i = 0; i < q; i++) {
```

Line: 36 Col: 15

Upload Code as File  Test against custom input  Run Code  Submit Code

Run Code Submit Code

## Congratulations!

You have passed the sample test cases. Click the submit button to run your code against all the test cases.

**Sample Test case 0**

**Sample Test case 1**

Input (stdin) Download

```
3
5 2
8 5
2 2
```

Your Output (stdout)

```
1
4
0
```

Expected Output Download

```
1
```