

## Kth Smallest Number in Multiplication Table

Nearly every one have used the **Multiplication Table**. But could you find out the  $k$ -th smallest number quickly from the multiplication table?

Given the height  $m$  and the length  $n$  of a  $m * n$  Multiplication Table, and a positive integer  $k$ , you need to return the  $k$ -th smallest number in this table.

### Example 1:

**Input:**  $m = 3, n = 3, k = 5$

**Output:**

**Explanation:**

The Multiplication Table:

```
1 2 3
2 4 6
3 6 9
```

The 5-th smallest number is 3 (1, 2, 2, 3, 3).

### Example 2:

**Input:**  $m = 2, n = 3, k = 6$

**Output:**

**Explanation:**

The Multiplication Table:

```
1 2 3
2 4 6
```

The 6-th smallest number is 6 (1, 2, 2, 3, 4, 6).

### Note:

1. The  $m$  and  $n$  will be in the range  $[1, 30000]$ .
2. The  $k$  will be in the range  $[1, m * n]$

## Solution 1

```
class Solution {
    public int findKthNumber(int m, int n, int k) {
        int low = 1, high = m * n + 1;

        while (low < high) {
            int mid = low + (high - low) / 2;
            int c = count(mid, m, n);
            if (c >= k) high = mid;
            else low = mid + 1;
        }

        return high;
    }

    private int count(int v, int m, int n) {
        int count = 0;
        for (int i = 1; i <= m; i++) {
            int temp = Math.min(v / i, n);
            count += temp;
        }
        return count;
    }
}
```

written by [shawngao](#) original link [here](#)

## Solution 2

The name and description are very misleading. This should be the kth smallest number.

written by [Tong.Liu](#) original link [here](#)

## Solution 3

This exact problem is found on the Codeforces OJ on this link:

<http://codeforces.com/contest/448/problem/D>

Its solution is also fully written on stack overflow on this link:

<https://stackoverflow.com/questions/33464901/using-binary-search-to-find-k-th-largest-number-in-nm-multiplication-table>

I found several people who blindly copied that code and got AC!. The reason I know this problem was on Stackoverflow was because **I** was the one who asked that question in 2015!!

written by [eyfmharb](#) original link [here](#)

From [LeetCoder](#).