11550. x1 + x2 + … + xk = n

Given the values of *k* and *n*, find the number of positive integral solutions for the equation

*x*1 ​+ *x*2 + ...+ *xk* = *n*

**Input.** Two positive integers *k* and *n* (*k* ≤ *n* ≤ 100).

**Output.** Print the number of positive integral solutions for the given equation. It is known that the answer is no more than 1018.

|  |  |
| --- | --- |
| **Sample input** | **Sample output** |
| 3 4 | 3 |

## SOLUTION

**combinatorics**

# Algorithm analysis

Consider a sequence of *n* ones: 111…11. You can insert a ‘+’ sign between any two ones. For example, 11+111+1. Such notation denotes the sum 2 + 3 + 1, where each term represents the number of ones adjacent to each other. The number of positions where a ‘+’ sign can be inserted is *n* – 1. Since the sum must consist of *k* terms, *k* – 1 ‘+’ signs should be inserted.

We should insert *k* – 1 pluses in *n* – 1 places. This can be done in  ways.

**Example**

Consider the equation *x*1 ​+ *x*2 + *x*3 = 4. It has 3 positive integer solutions: (1, 1, 2), (1, 2, 1), (2, 1, 1).

For example, *n* = 4 ones can be divided into *k* = 3 terms in  = 3 ways:



**Note**

Let’s consider a few variations of this problem:

* A teacher brought *n* identical candies to class and wants to distribute them among *k* students so that each student receives at least one candy. Find how many ways this can be done.
* There are *n* identical notebooks on a desk. They need to be arranged into *k* piles so that each pile contains at least one notebook. Determine how many ways this can be done.

**Algorithm implementation**

The ***Cnk*** function computes the value of the binomial coefficient .

long long Cnk(long long k, long long n)

{

 long long res = 1;

 if (k > n - k) k = n - k;

 for (long long i = 1; i <= k; i++)

 res = res \* (n - i + 1) / i;

 return res;

}

The main part of the program. Read the input data.

scanf("%lld %lld", &k, &n);

Compute and print the answer – the value of .

res = Cnk(k - 1, n - 1);

printf("%lld\n", res);

**Python implementation**

**import** math

Read the input data.

k, n = map(int,input().split())

Compute and print the answer – the value of .

res = math.comb(n - 1, k - 1)

print(res)