



CS3201 Algorithm Design

Term Project Report

Problem: 1402. Cocktails

Submitted to

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Submitted by

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Introduction

Problem: 1402

Time Limit: 1.0 second

Memory Limit: 64 MB

Difficulty: 135

Description:

Henry Shaker works as a barman in the favorite pub of Vito Maretti. Every evening he pleases the gangster with a new cocktail: vodka and Martini, gin and orange juice, kefir and mineral water. Vito pays generously for each new cocktail, but if the barman repeats a cocktail he is in trouble: Vito may shoot him. So Henry wants to know how soon he will have to leave the town. In order to know this you are to count how many different cocktails he can make having N components. A cocktail is the mixture of two or more components. Unfortunately, Henry can't use one component more than once in the same cocktail. Nevertheless 'vodka and Martini' and 'Martini and vodka' are two different cocktails.

Input:

The first input line contains an integer N ($1 \leq N \leq 21$) — an amount of components.

Output:

an integer number of possible cocktails.

Input	Output
3	12

Problem Author: Sergey Pupyrev

Problem Source: The 12th High School Pupils Collegiate Programming Contest of the Sverdlovsk Region (October 15, 2005)

Code Overview

```
n = int(input())

result = 0

def factorial(x):
    if x == 0:
        return 1
    else:
        return x * factorial(x-1)

for i in range(2, n + 1):
    result += int(factorial(n)/factorial(n-i))

print(result)
```

Problem solution

We solve the problem by permutation $n-1$ times

$$\frac{n!}{(n-r)!} + \frac{n!}{(n-(r-1))!} + \frac{n!}{(n-(r-2))!} + \dots + \frac{n!}{(n-(r-(n-1)))!}$$

n is the numbers of components

r is the numbers of ingredients in cocktails decreasing by 1 every time

Test Case

#1

Input	Output
2	2

#2

Input	Output
3	12

#3

Input	Output
8	109592

#4

Input	Output
11	108505100

#5

Input	Output
17	966858672404672

Submission result

Author	Problem	Language	Judgement result	Test #	Execution time	Memory used
sittisak	1402. Cocktails	Python 3.6	Accepted		0.078	300 KB