



ASSUMPTION UNIVERSITY  
Vincent Mary School Of Science and Technology  
Department of Computer Science

CS3201  
Algorithm Design  
Term Project Report

1260. Nudnik Photographer  
Timus Online Judge

Submit to  
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By  
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## Problem Definition

### 1260. Nudnik Photographer

Time limit: 1.0 second

Memory limit: 64 MB

Problem Author: Alexander Ipatov

Problem Source: Open collegiate programming contest for high school children of the Sverdlovsk region, October 11, 2003

Level of difficulty: 116

Everyone knows that the mathematical department of the Ural State University is a big family of  $N$  persons, 1, 2, 3, ...,  $N$  years old respectively.

Once the dean of the department ordered a photo of his big family. There were to be present all the students of the department arranged in one row. At first the dean wanted to arrange them by their age starting from the youngest student, but then he decided that it would look unnatural.

Then he advised to arrange the students as follows:

1. The 1 year old student is to sit at the left end of the row.
2. The difference in ages of every two neighbors mustn't exceed 2 years.

The dean decided that thereby the students would seem look as they were arranged by their ages (one can hardly see the difference in ages of 25 and 27 years old people). There exist several arrangements satisfying to the requirements. Photographer didn't want to thwart dean's desire and made the photos of all the possible mathematical department students' arrangements.

## Input

There is the integer number  $N$ ,  $1 \leq N \leq 55$ .

## Output

the number of photos made by the photographer.

Sample Input & Output

| Input | Output |
|-------|--------|
| 4     | 4      |

## Code overview

```
1  nud = int(input())
2
3  combo = [None] * (nud + 1)
4
5  def mem_cal(nud):
6      if combo[nud] is None:
7          if nud <= 2:
8              w = 1
9          elif nud == 3:
10             w = 2
11          else:
12             w = mem_cal(nud - 1) + mem_cal(nud - 3) + 1
13             combo[nud] = w
14         return combo[nud]
15
16 print(mem_cal(nud))
```

Line 1: Received the integer input and assign it to variable 'nud'

Line 3: Using memoization technique, declaring a list 'combo' to store the result of each recursion call

Line 7-9: If nud equals to 2 or more,  $w = 1$  and if nud equals 3,  $w = 2$ .

Line 12: If nud is more than 3, adding the result of (nud - 1) adding (nud - 3) add 1.

Line 13: Store the result into the list Combo

Line 14: Return the result when the position of the list at nud is not none

The overview of the code is similar to the fibonacci algorithm. However the technique used to figure this problem is finding pattern in permutations of some possible inputs.

If the input is 5, then the permutations are:

```
1 2 3 4 5
1 2 3 5 4
1 2 4 3 5
1 2 4 5 3
1 3 2 4 5
```

1 3 5 4 2

The first 4 permutations, which begins with '1 2', if ignore '1', the result of the permutations are the same as the result of input 4. The 5th permutation, which begins with '1 3 2', the result of permutation is the same as the result of input 2. The last permutation is the special case where number 2 is place at the end.

## Input sample

| Input | Output            |
|-------|-------------------|
| 5     | 6                 |
| 12    | 100               |
| 15    | 317               |
| 20    | 2149              |
| 100   | 41019895343287489 |

## Submission

| ID                      | Date                    | Author                     | Problem                                   | Language   | Judgement result    | Test # | Execution time | Memory used |
|-------------------------|-------------------------|----------------------------|-------------------------------------------|------------|---------------------|--------|----------------|-------------|
| <a href="#">8139043</a> | 11:51:52<br>16 Nov 2018 | <a href="#">t.tansuwan</a> | <a href="#">1260. Nudnik Photographer</a> | Python 3.6 | Accepted            |        | 0.078          | 304 KB      |
| <a href="#">8139042</a> | 11:50:39<br>16 Nov 2018 | <a href="#">t.tansuwan</a> | <a href="#">1260. Nudnik Photographer</a> | Python 3.6 | Time limit exceeded | 15     | 1.029          | 296 KB      |