The University of Hong Kong

COMP1117A Computer Programming

Assignment 3

Deadline: 11:59 pm Nov 25, 2024

Reminders

This assignment involves some console input/output. You are reminded that the VPL system on HKU Moodle evaluates your program with a full score under the condition that **your program output is the EXACT MATCH of the expected output**. In other words, any additional or missing space character, tab character, newline character, etc. will be treated as errors during the evaluation of your program. Also, you are advised to make **more test cases on your own** for testing your program.

Question 1 (40 %)

Assume Alice wants to climb a staircase with n steps. Alice can climb at most k steps and at least 1 step in one move. In this assignment, please provide a Python program with input n and k to count the number of ways Alice can climb the staircase. You should use recursion to solve this problem. The file a3q1.py gives the framework of the program. Implement the functions defined in a3q1.py to complete the program.

Please carefully read the following test cases for a better understanding.

Sample Test Cases

Sample Test Case 1	
Input	3 2
Output	3
Explanation	There are 3 ways Alice can climb up the stairs because 3=1+1+1, 3=1+2 and 3=2+1.

Sample Test Case 2	
Input	4

	3
Output	7
Explanation	There are 7 ways Alice can climb up the stairs because 4=1+1+1+1, 4=2+1+1, 4=1+2+1, 4=1+1+2, 4=2+2, 4=1+3 and 4=3+1.

Assignment Specifications and Requirements

Here is the given program:

```
n = int(input())
k = int(input())

# Begin of your implementation ------

# End of your implementation ------

def count_ways(""" parameters """):
    # Begin of your implementation ------

    # Begin of your implementation ------

num_ways = count_ways(""" parameters """)
print(num_ways)
```

Please define/input the function parameters to replace """ parameters """, and enter your code in the block between comments like this:

```
# Begin of your implementation ------

# End of your implementation ------
```

- The code for read **n** and **k** has already been given. You do not need to change it.
- You are expected to use **recursion** algorithm to solve this problem. It will have a 20% deduction if your submission is not a recursion solution.
- **Hint**: If k=2, then [the number of ways when there are n steps] = [the number of ways when there are n-1 steps] + [the number of ways when there are n-2 steps]. Think about situations where k is larger.
- You can start the recursion on **count_ways()**, or you can define another recursive function and use **count_ways()** to call it. You may define as many functions as you need, but you are not required to do so.
- You must show the output of the function using the print() provided above. You are not allowed to change any line of code that without additional descriptions in the given program.
- Make sure your program can handle the input range $0 < \mathbf{k} < 5$, $0 < \mathbf{n} < 10$ where **n** is a positive integer.
- You can use any built-in functions that come with the Python installation.

Question 2 (60 %)

In this question, you are going to build text editor. Please read this assignment sheet carefully before starting your work.

The file a3q2.py gives the framework of the program. Please fill it.

You need to build a text editor that can implement a series of operations on of a given original text. These functions are:

- Write (text, str): Add str (String) after the text.
- Delete (text, A, B): Delete the B(int) characters from the A^{th}(int) character of the text.
- Insert (text, str, A): Insert str(String) before the A^{th}(int) character of the text.
- Search (text, str): Count how many times str(String) appears in the text.

Assignment Specifications and Requirements

Please enter your code in the block between comments like this:

```
# Begin of your implementation ------

# End of your implementation ------
```

You are required to complete the 4 functions (**Write, Delete, Insert, Search**) below to complete the program.

(Note: The red text is input via console. The number indicating function called and parameters are separated by space.)

```
tobeortopython
2 9 6
tobeorto
1 be
tobeortobe
3 not 7
tobeornottobe
4 to
2
-1
```

This is a sample case. The first line is the original text. From the second line, each line includes an integer indicating which function is called and the parameters of the function. “1” for **Write**, “2”

for **Delete**, “3” for **Insert**, “4” for **Search**. The result is printed on the screen after each line of the input. For **Search**, display the number of occurrences of the string. Otherwise, display the processed text. And the program ends with “-1”.

You need to handle the following cases, but you can assume they would not happen simultaneously in our test cases.

- The A^{th} character doesn’t exist for function **Delete** and **Insert**.
- There aren’t A characters after the B^{th} character for function **Delete**.

Output “Error” in these cases.

Notes:

1. Please refer to the sample test cases to handle the different kinds of output. **Your program output should be the EXACT MATCH of the expected output**.

2. You can assume user inputs are always valid.

3. You can use any built-in functions that come with the Python installation.

Sample Test Cases

The red text is the part you need to input via console.

Sample Test Case 1
tobeortopython 2 9 6 tobeorto 1 be tobeortobe 3 not 7 tobeornottobe 4 to 2 -1

Sample Test Case 2
ilove 1 python ilovepython 4 hku 0 2 1 1 lovepython 3 we 1 welovepython -1

Appendix

Important Notes

- Your program must follow the formats of the sample inputs/outputs strictly.
- We will grade your programs with **another set of test cases** (i.e., not limited to the sample test cases presented in this document).

Handin

- Submit your programs electronically using the Moodle system to Assignment 3 Question 1 and Assignment 3 Question 2 under Assignments section.
- Late submission will **NOT** be accepted.

Policy on "Plagiarism" according to the General Office

- Plagiarism is a very serious academic offence. Students should understand what constitutes plagiarism, the consequences of committing an offence of plagiarism, and how to avoid it.
- Definition of Plagiarism:
  - As defined in the University's Regulations Governing Conduct at Examinations, plagiarism is "the unacknowledged use, as one's own, of work of another person, whether or not such work has been published.", or put it simply, plagiarism is copying (including paraphrasing) the work of another person (including an idea or argument) without proper acknowledgement.
  - In case of queries on plagiarism, students are strongly advised to refer to "What is Plagiarism".
- If a student commits plagiarism, with evidence after investigation, no matter whether the student concerned admits or not, a penalty will be imposed:
  - First Attempt: if the student commits plagiarism (in an assignment/test of a CS course) for the first time in his/her entire course of study, the student shall be warned in writing and receive zero mark for the whole assignment or the whole test; if the student does not agree, s/he can appeal to the BEng(CompSc) Programme Director within a week.
  - Subsequent Attempt: if the student commits plagiarism more than once in higher course of study, the case shall be referred to the Programme Director for consideration. The Programme Director shall investigate the case and consider referring it to the University

Disciplinary Committee, which may impose any of the following penalties: a published reprimand, suspension of study for a period of time, fine, or expulsion from the University.

- Both the student who copies other's work and the student who offers his/her work for copying shall be penalized.
- Teachers should report plagiarism cases to the General Office for records and the issuing of warning letters.