

Why was the computer cold?

Thank you,  
Jayden

It left its Windows open!

Source: \n<https://punsteria.com/computer-science-puns>

# CMPT 120

Lecture 22 – Practice Exam 6 - SOLUTION

# In-Class Activity

Course grading scheme on our course website: **Best 7 in-class exercises out of 10: 1% each, for a total of 7%**

- Our **in-class activity #6** -> 1%
  - Write your answer to question **\_2\_** on a sheet of paper
  - Write your **lastname**, **firstname** and **student number**
  - At the end of today's class, hand in your sheet of paper in the appropriate pile:
    - **Pile 1** -> if your lastname start with a letter that is between '**A**' and '**L**'
      - **Pile 1** is on your **left-hand side** of the classroom
    - **Pile 2** -> if your lastname start with a letter that is between '**M**' to letter '**Z**'
      - **Pile 2** is on your **right-hand side** of the classroom

First, let's  
demonstrate  
Box Tracing

# Box Tracing

## factorial

```
# ***Main part of program
# Call factorial with number
print(f'{number}! = {factorial(number)}')
```

```
def factorial(aNumber):
    """Recursive factorial function with aNumber
       as parameter and returning aNumber!"""

    # Base Case
    if aNumber <= 1:
        return 1

    # Recursive Case
    return aNumber * factorial(aNumber-1)
```

Execution of the main part of program



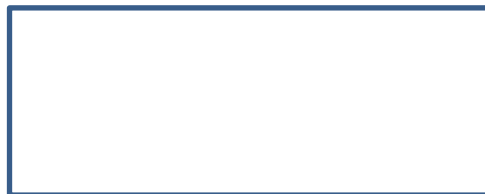
1<sup>st</sup> execution of factorial (1<sup>st</sup> invocation)



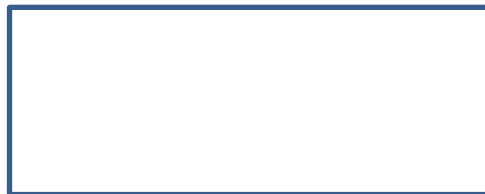
2<sup>nd</sup> execution of factorial (2<sup>nd</sup> invocation)



3<sup>rd</sup> execution of factorial (3<sup>rd</sup> invocation)



4<sup>th</sup> execution of factorial (4<sup>th</sup> invocation)



5<sup>th</sup> execution of factorial (5<sup>th</sup> invocation)



Try to answer the questions **1<sup>st</sup> without using your computer**, then confirm your answer using IDLE!

# Theory and Understanding

# Question 1

Consider the following program:

```
def special(numbers):
```

```
    for num1 in numbers:
```

```
        for num2 in numbers:
```

```
            if num1 < num2:
```

```
                return num1 + num2
```

outer  
loop

inner  
loop

```
# ***Main part of the program  
print(special([3,1,2]))
```

- a. What would it print on the computer monitor screen once it has completely executed? **4**
- b. What is the value of the variable **num2** during the outer loop's 1<sup>st</sup> iteration and inner loop's 2<sup>nd</sup> iteration? **num2 = 1**
- c. What is the value of the variable **num1** when the **return** statement is executed? **num1 = 1**

## Q. 2

Consider the following program:

```
def printTriangleOfChar(aChar, aLength):
    '''Recursively prints "aChar" in an increasing number
       of times in the shape of a right-angle triangle, where
       "aLength" is the length of the base of the triangle.'''

    # Base Case
    if aLength == 0 :
        return

    # Recursive Case
    printTriangleOfChar(aChar, aLength-1)

    print(F'{aChar * aLength}')
    return

**** Main part of my program

# Ask the user for a character
theChar = input("Please, enter the character: ")

# Ask the user for the length of the base of the triangle
baseLength = int(input(f"Please, the length of the base of the triangle: "))

# Call printTriangleOfChar with this character and this base length
printTriangleOfChar(theChar, baseLength)
```

- a. How many lines will be printed on the screen when the user enters **6** as the base length?

Overall, the program prints **8** lines and the function itself prints **6** lines:

```
Please, enter the character: $
Please, the length of the base of the triangle: 6
$
$$
$$$
$$$$
$$$$$
$$$$$$
```

## Q. 2

Consider the following program:

```
def printTriangleOfChar(aChar, aLength):  
    '''Recursively prints "aChar" in an increasing number  
    of times in the shape of a right-angle triangle, where  
    "aLength" is the length of the base of the triangle.'''  
  
    # Base Case  
    if aLength == 0 :  
        return  
  
    # Recursive Case  
    printTriangleOfChar(aChar, aLength-1)  
  
    print(F'{aChar * aLength}')    return  
  
*** Main part of my program  
  
# Ask the user for a character  
theChar = input("Please, enter the character: ")  
  
# Ask the user for the length of the base of the triangle  
baseLength = int(input(f"Please, the length of the base of the triangle: "))  
  
# Call printTriangleOfChar with this character and this base length  
printTriangleOfChar(theChar, baseLength)
```

- b. How many times will the function **printTriangleOfChar** be called when the above program executes and the user enters **#** as the character and **5** as the base length? **6 times**
- c. What is the value of **aLength** during the above recursive function's 4<sup>th</sup> invocation when the user enters **\*** as the character and **7** as the base length? **aLength = 4**



# Coding

Try to solve the problem  
(i.e., write your Python  
program) **1<sup>st</sup> on a piece  
of paper without using  
your computer!**

# Question 3

## Step 1 - Problem Statement

Write a program that reverses a string recursively.  
For example, your function would reverse  
“**Hello, World!**” producing “**!dlroW ,olleH**”

You can assume that the user is **well-behaved**.

## Question 4

## Step 1 - Problem Statement

Write a program that prints stars recursively.

- **Sample Run 1:**

```
Please, enter the number of stars to print: 6  
*****  
*****  
*****  
****  
***  
**  
  
*  
  
*  
  
**  
  
***  
  
****  
  
*****
```

- **Sample run 3:**

```
Please, enter the number of stars to print: 1
★
★
```

- **Sample run 4:**

```
Please, enter the number of stars to print: 0
```

## Sample Run 2:

```
Please, enter the number of stars to print: 12  
*****  
*****  
*****  
*****  
*****  
*****  
*****  
*****  
*****  
*****  
****  
***  
**  
*  
  
*  
  
**  
  
***  
  
****  
  
*****  
  
*****  
  
*****  
  
*****
```