Why was the computer cold?

It left its Windows open!

Thank you, Jayden

Source:\nhttps://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

1st execution of factorial (1st invocation)

2nd execution of factorial (2nd invocation)

3rd execution of factorial (3rd invocation)

4th execution of factorial (4th invocation)

5th execution of factorial (5th invocation)

Theory and Understanding

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

Question 1

Consider the following program:

```
def special(numbers):
    for num1 in numbers:
        for num2 in numbers:
            if num1 < num2:
                return num1 + num2

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

outer loop

inner loop

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 1st iteration and inner loop's 2nd 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 4th 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) **1st 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 2:**

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

- **Sample run 3:**

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

- **Sample run 4:**

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