



COMPUTER SCIENCE 10A (FALL TERM, 2021)

INTRODUCTION TO PROBLEM SOLVING IN PYTHON

PROGRAMMING ASSIGNMENT 4

DUE: OCT 21

Program Description:

This assignment will test your understanding of the use of **for loops** and **parameters**. Write ten programs to solve the following problems and name each script Problem1.py, Problem2.py, etc.

For this assignment, you must limit yourself to the Python features covered up to lecture 10. Though we will cover more material while you work on this assignment, please do not use it on this assignment.

Problem 1: The Fibonacci numbers are a sequence of integers in which the first two elements are 1 and each following element is the sum of the two preceding elements. The mathematical definition of each k th Fibonacci number is the following:

$$F(k) = \begin{cases} F(k-1) + F(k-2), & k > 2 \\ 1, & k \leq 2 \end{cases}$$

The first 12 Fibonacci numbers are: 1 1 2 3 5 8 13 21 34 55 89 144

Write a program that computes and prints the first 12 Fibonacci numbers.

Problem 2: Write a program that produces the following output (you must only use nested for loops).

```
*
* *
* * *
* * * *
* * * * *
```

Problem 3: Write a program that produces the following output (you must only use nested for loops).

```
* * * * *
* * * *
* * *
* *
*
```

Problem 4: Write a program that produces the following output (you must only use nested for loops).

```

      *
     * *
    * * *
   * * * *
  * * * * *
 * * * * *

```

Problem 5: Write a program that produces the following output. Use for loops and string multiplication to capture the structure of the figure.

```

!!!!!!!!!!!!!!!!!!!!!!
\\!!!!!!!!!!!!!!!!!!!!//
\\\!!!!!!!!!!!!!!!!!!!!//
\\\\\!!!!!!!!!!!!!!!!!!!!//
\\\\\\!!!!!!!!!!!!!!!!!!!!//
\\\\\\\\\!!!!!!!!!!!!!!!!!!!!//
\\\\\\\\\\!!!!!!!!!!!!!!!!!!!!//
\\\\\\\\\\\\\!!!!!!!!!!!!!!!!!!!!//

```

Problem 6: Modify the program you wrote for problem 5 to make use of a constant for the height of the figure. Your program should output a figure of height 4.

Problem 7: Write a program that prompts the user for a positive integer n and prints each number from 1 up to n , inclusive, boxed by square brackets. A possible dialogue with the user might be:

```

Please enter a positive integer: 4
[ 1 ] [ 2 ] [ 3 ] [ 4 ]

```

Problem 8: Write a program that prompts the user for two integers a base and an exponent, and prints each power of the base from base^0 up to $\text{base}^{\text{exponent}}$, inclusive. **Note: the base can be a positive or a negative integer.**

A possible dialogue with the user might be:

```

Please enter an integer indicating the base: 3
Please enter a positive integer indicating the exponent: 4
1 3 9 27 81

```

Problem 9: Write a program that prompts the user for two positive integers (a minimum and a maximum) and prints a square of lines of increasing numbers. The first line should start with the minimum, each line that follows should start with the next-higher number. The sequence of numbers on a line wraps back to the minimum after it hits the maximum.

A possible dialogue with the user might be:

```
Please enter a minimum integer: 3
Please enter a maximum integer: 7
```

```
34567
45673
56734
67345
73456
```

Problem 10: A certain bank offers 0.65% interest on savings accounts, compounded annually. Create a table that shows how much money a person will accumulate over the number of years that they want to save their money for. Assume that the person makes an initial investment of \$1000 and deposits \$100 each year after the first. Your table should indicate for each year the current balance, the interest, the new deposit, and the new balance. For example:

For how many years do you want to save?4				
Year	Curr Balance	Interest	New Deposit	New Balance
0	1000.0	6.5	100.0	1106.5
1	1106.5	7.19	100.0	1213.69
2	1213.69	7.88	100.0	1321.58
3	1321.58	8.59	100.0	1430.17

Guidelines:

You should not have any code, except a call to your `main` function, outside of a function. You should use the `main` function to call other functions that implement the solution.

Include a header comment at the beginning of your program with some basic information and a description of the program in your own words.

```
# Name Student
# COSI 10a, Fall 2021
# Programming Assignment #4
#
# Description: ...
```

You also need to include comments in your code.

Submission and Grading:

All your python programs should be inside a folder named `yourfirstname_yourlastnamePA4`, then zip the folder into a zip file for submission. The zip file should have

the following name: `yourfirstname_yourlastnamePA4.zip` (Please make sure to use exactly this file name, including identical capitalization).

Your program should be submitted via Latte before it is due (for late policy check the syllabus).

You will be graded on:

- **External Correctness:** The output of your program should match exactly what is expected. Programs that do not compile will not receive points for external correctness.
- **Internal Correctness:** Your source code should follow the stylistic guidelines shown in class. Remember to include the comment header at the beginning of your program and comment your code.