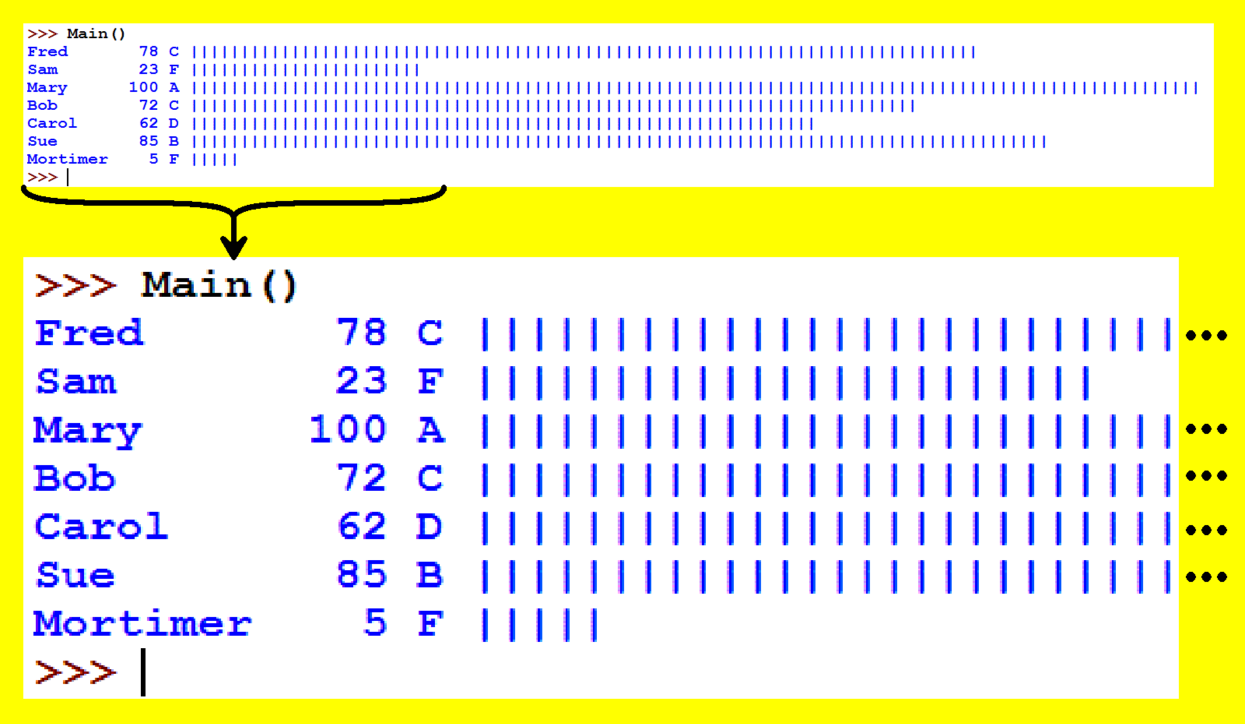
**CMPSCI 119**
**LAB #1 – Bar Graphs**
**Professor William T. Verts**

The goal of this first Python programming assignment is to successfully create, enter, debug, and run a simple program in the Idle environment. If you have not done so already, you must first install the environment on your own personal computer. Please set up a special folder on your desktop or in your documents folder to hold all your Python projects. I also suggest that you buy a flash drive (SanDisk recommended) and put a folder for your Python projects there as well; the flash drive can then be used for backup and for bringing code in for us to help you debug.

## ***Background***

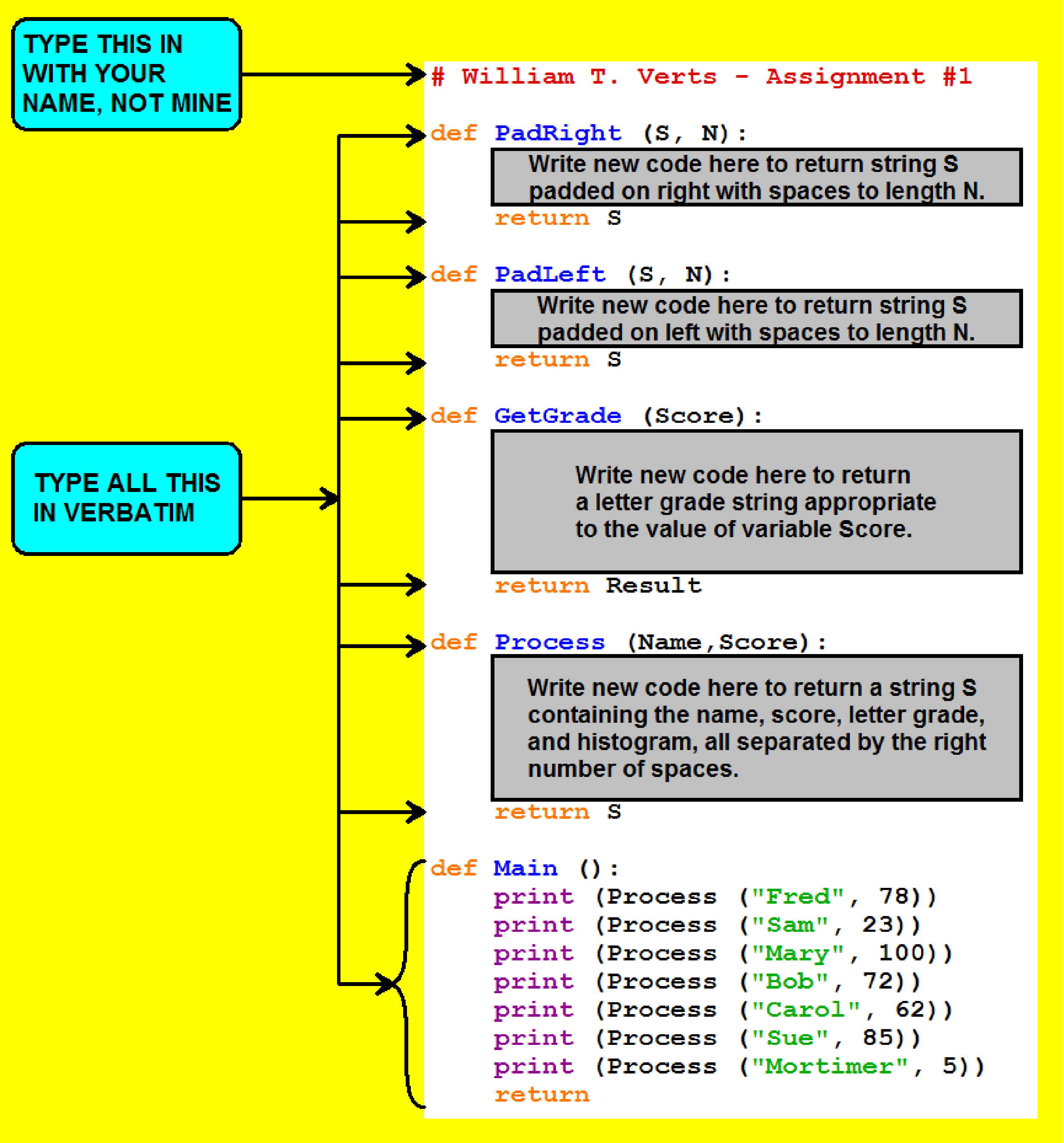
In this assignment you are going to write a program to enter a set of grades for students who have taken an exam, and then generate a set of text-based bar graphs based on those grades. For example, if student Fred received a 78 on his exam, the line of output for Fred will be his name, his score, his letter grade, and then 78 copies of the | character (the vertical bar), padded appropriately with blanks. When your program runs, the expected output from Idle/Python will look like the following image (the top image is the whole output, the bottom is the left part zoomed up so you can see it more easily):



```
>>> Main()
Fred       78 C ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
Sam        23 F |||||||||||||||||||||||
Mary      100 A ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
Bob        72 C ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
Carol      62 D ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
Sue        85 B |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
Mortimer    5 F |||||
>>> |
```

## ***Setting up the Assignment***

Type in the following program code framework just as you see it here, and then save it in your Python folder with `Lab1.py` as the filename. Leave the gray areas blank; you will write new code there later.



TYPE THIS IN WITH YOUR NAME, NOT MINE

TYPE ALL THIS IN VERBATIM

```
# William T. Verts - Assignment #1
def PadRight (S, N):
    Write new code here to return string S
    padded on right with spaces to length N.
    return S

def PadLeft (S, N):
    Write new code here to return string S
    padded on left with spaces to length N.
    return S

def GetGrade (Score):
    Write new code here to return
    a letter grade string appropriate
    to the value of variable Score.
    return Result

def Process (Name,Score):
    Write new code here to return a string S
    containing the name, score, letter grade,
    and histogram, all separated by the right
    number of spaces.
    return S

def Main ():
    print (Process ("Fred", 78))
    print (Process ("Sam", 23))
    print (Process ("Mary", 100))
    print (Process ("Bob", 72))
    print (Process ("Carol", 62))
    print (Process ("Sue", 85))
    print (Process ("Mortimer", 5))
    return
```

Notice that there are four functions which need to be finished, `PadRight`, `PadLeft`, `GetGrade`, and `Process`. You can complete and debug each function in order, before working on the next function in the program. Function `Main` is finished as-is and must not be modified from what you see here.

## ***Task #1 – PadLeft and PadRight***

The `PadRight` function has two parameters: `S` (a string) and `N` (an int), and returns as its result the string `S` padded on the right with blanks until the length of `S` contains no fewer than `N` characters. The `PadLeft` function is identical to `PadRight` except that it adds blanks to the left side of the string.

For example, the string `"Frog"` is four characters long, so `PadLeft("Frog",7)` would return the seven-character string `"   Frog"` (with the extra blanks on the left) and `PadRight("Frog",7)` would return the seven-character string `"Frog   "` (with the extra blanks on the right).

However, the string `"Froggies"` is *already* longer than seven characters, so both `PadLeft("Froggies",7)` and `PadRight("Froggies",7)` would return the original string `"Froggies"` unchanged as the result.

| | | |
|---|---|---|
| **`PadLeft("Frog", 7)`** | **returns the 7-character string:** | `   Frog` |
| **`PadRight("Frog", 7)`** | **returns the 7-character string:** | `Frog   ` |
| **`PadLeft("Froggies", 7)`**<br>**`PadRight("Froggies", 7)`** | **return the 8-character string:** | `Froggies` |

You will need to use the standard Python `len` function to ask about the current length of a string.

Complete these functions, then test them from the `>>>` command line prompt with different strings and different lengths to make sure that they handle all possible cases. Common problems include "off-by-one" errors, where the number of blanks might be one too few or one too many – check this!

## ***Task #2 - GetGrade***

The `GetGrade` function has one `int` parameter called `Score`. The function must return the one-character string `"A"` if `Score` is greater than or equal to 90, `"B"` if `Score` is greater than or equal to 80, `"C"` if `Score` is greater than or equal to 70, `"D"` if `Score` is greater than or equal to 60, and `"F"` otherwise.

Complete this function, then test it with different values for `Score` to make sure it handles all five grade ranges correctly, including exactly 90, 80, 70, and 60.

## ***Task #3 - Process***

The Process function has two parameters, Name and Score. Those parameters will be passed the name and the score for a particular student. For example, if the function is called as Process("Fred",78) then Name will contain the string "Fred" and Score will contain the integer 78.

The Process function initializes a string S to the empty string, and then builds up and returns S as the value of the function, where S will contain the following items, in this order:

1: Student's name, padded on the right to 10 characters (columns 1…10),
2: Student's score, converted to a string, and padded on the left to 3 characters (columns 11…13),
3: Student's grade, padded on the left to 2 characters (columns 14…15),
4: one extra blank (column 16),
5: the correct number of vertical bar characters (columns 17…17+Score-1).

This function starts to build the string S by calling PadLeft, PadRight, and GetGrade with the appropriate actual parameters.

This function then also requires the use of a loop to add to the string the correct number of vertical bar characters; for this assignment I want you to use a counter loop (a variable with a while-loop, and not a for-loop).

Finish the function by writing code in the gray area to do all of this.

The Process function must not contain any print statements. It returns its result as the value of the function; printing happens in the Main function.

Test your function by calling Process from the >>> command line prompt as Process("Fred",78) , which would return as the value of S the following string:

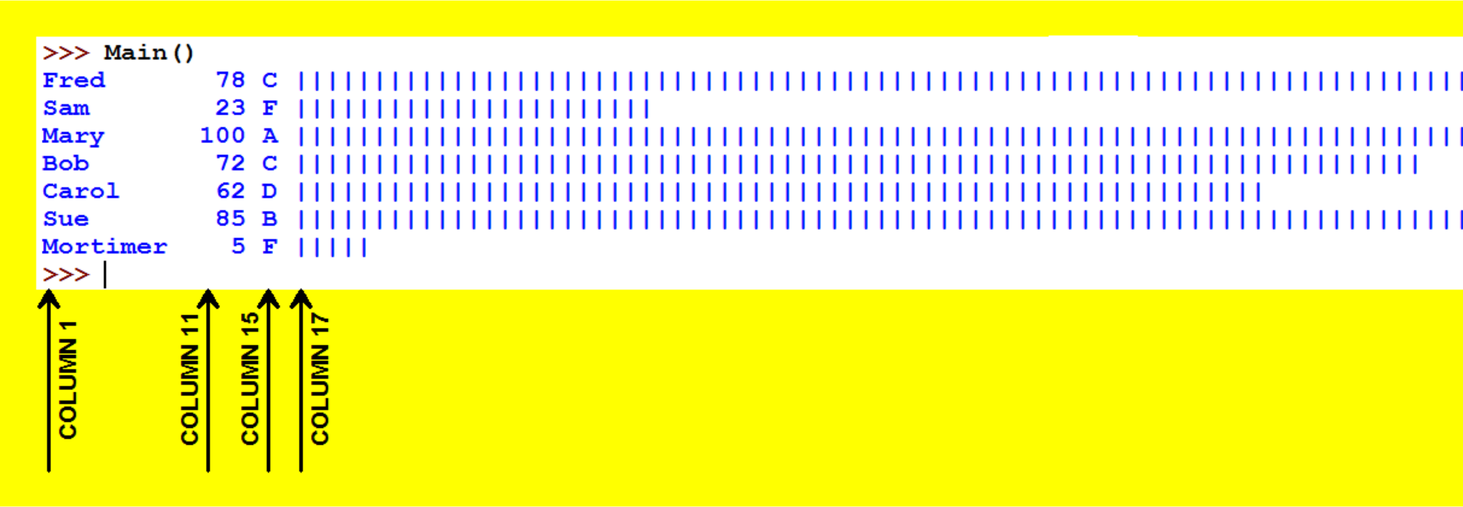
```
Fred       78 C ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
```

Similarly, manually test Process("Sam",23) and Process("Mary",100) to verify that your function works correctly. Common problems include "off-by-one" errors, where the number of vertical bars might be one too few or one too many – check this!

***Running the Program***

Run the program by typing `Main()` at the command prompt.

You should then get all seven lines of output as shown here, with the spacing as indicated in the following image:



```
>>> Main()
Fred       78 C |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
Sam        23 F |||||||||||||||||||||||
Mary      100 A |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
Bob        72 C ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
Carol      62 D ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
Sue        85 B |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
Mortimer    5 F |||||
>>> |
```

If the output does not contain the correct information, debug your program and run it again. Continue to edit and test your program until the resulting output does contain the correct information.

***Finishing Up***

When you are finished and everything runs correctly, go to the class site and click on the link for submitting lab assignments. In Idle select all the text, copy it to the clipboard, in the Web page paste the text into the program area of the submission form, fill in your name and ID number and the lab number in the appropriate slots, and then submit the assignment for grading as Lab #1.

The graders will score your program by running `Main` to see if it correctly generates the appropriate graphs. You will also be graded on efficiency as well as completeness, and the graders will be also testing each of your functions explicitly.