Lab 3 Repetition Structures

1. Printing patterns

You can choose between 1A and 1B or you can do both questions if you want.

1A. Write a program that uses nested loops to draw this pattern:

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

1B. Write a program that uses nested loops to draw this pattern:

```
##
# #
#  #
#   #
#    #
#     #
```

Source: Gaddis, T., & Agarwal, R.. Starting out with Python. Pearson

2. Credit Card Number Check

The last digit of a credit card number is the check digit, which protects against transcription errors such as an error in a single digit or switching two digits. The following method is used to verify actual credit card numbers but, for simplicity, we will describe it for numbers with 8 digits instead of 16:

• Starting from the rightmost digit, form the sum of every other digit. For example, if the credit card number is 4358 9795, then you form the sum 5 + 7 + 8 + 3 = 23.

• Double each of the digits that were not included in the preceding step. Add all digits of the resulting numbers. For example, with the number given above, doubling the digits, starting with the next-to-last one, yields 18 18 10 8. Adding all digits in these values yields 1 + 8 + 1 + 8 + 1 + 0 + 8 = 27.

• Add the sums of the two preceding steps. If the last digit of the result is 0, the number is valid. In our case, 23 + 27 = 50, so the number is valid.

Write a program that implements this algorithm. The user should supply an 8-digit number, and you should print out whether the number is valid or not. If it is not valid, you should print out the value of the check digit that would make the number valid.

Source: Horstmann, C. S. (2009). *Big Java: Compatible with Java 5, 6 and 7*. John Wiley & Sons.

3. GPA

Write a program that computes a user's GPA on a 4 point scale. Each grade on a 4 point scale is multiplied by the number of credits for that class. The sum of all the credit, grade products is divided by the total number of credits earned. Assume the 4 point scale assigns values of 4.0 for an A, 3.7 for an A-, 3.3 for a B+, 3.0 for a B, 2.7 for a B-, 2.3 for a C+, 2.0 for a C, 1.7 for a C-, 1.3 for a D+, 1.0 for a D, 0.7 for a D-, and 0 for an F. Ask the user to enter their credit grade pairs using the following format until the enter 0 for the number of credits.

Output example

```
This program computes your GPA.

Please enter your completed courses.

Terminate your entry by entering 0 credits.

Credits? 4

Grade? A

Credits? 3

Grade? B+

Credits? 4

Grade? B

Credits? 2

Grade? C

Credits? 0

Your GPA is 3.22
```

Source: Lee, K. D. (2011). *Python programming fundamentals*. Springer.

4. Mean and standard deviation.

Write a program that reads a set of floating-point data values from the input. When the user indicates the end of input ('Q'), print out the average, and the standard deviation.

Output Example

```
Enter a number: 52.3

Enter a number: 32.9

Enter a number: 45.2

Enter a number: 28

Enter a number: 11

Enter a number: -8

Enter a number: Q

average is 26.90 sd is 22.31
```