COMP1200-MatLab - Lab 06
Due midnight – Thursday – October 20
Submit `devPlan06.txt` and `Lab06.m` **via Blackboard**

Before you start writing your program:

Read all of these instructions carefully. The **`devPlan06.txt`** file at the assignment link is an incomplete development plan. You are to save the file and edited it by adding your name and the date and by completing: 1. STATE THE PROBLEM, 2. DESCRIBE THE INPUT AND OUTPUT REQUIREMENTS, and 3. WORK HAND EXAMPLES. Use the development plan as a guide when writing the m-script file solution for the following problem. **This file must be saved as a .txt file.**

For 3. WORK HAND EXAMPLES, find the slope and y-intercept using at least 4 pairs of velocity(x) and distance(y). **The values in your hand example should NOT be the ones used in the sample input and output below.**

NOTE: You will see later that the spelling and casing of file names is very important in MATLAB. Your submitted file(s) MUST be spelled and cased as instructed. [-5 points per file for not doing so.]

***Problem*:**

***Program*: Lab06.m**

Edwin Hubble used the Mount Wilson Observatory telescopes to measure features of nebulae outside the Milky Way. He found that there is a relationship between a nebula's distance from earth and the velocity with which it was traveling from the earth. Hubble's initial data on 24 nebula is presented in Table 1 in the problem scenario.

The relationship between distance and velocity led scientists to propose that the universe came into being with a Big Bang, a long time ago. If material scattered from the point of the Big Bang traveling at a constant velocity, the distance traveled can be determined.

***Problem Constants*:**
See instructions.

***Problem Inputs*:**
See instructions.

***Problem Outputs*:**
See instructions.

***Other variables*:**
See instructions.

***Relevant formulas*:**
See instructions.

Regression Definition:
A regression is a statistical analysis assessing the association between two variables. It is used to find the relationship between two variables.

Regression Formula:
Regression Equation y = mx + b

$$\text{Slope } (m) = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2}$$

$$\text{Intercept } (b) = \frac{(\sum y)(\sum x^2) - (\sum x)(\sum xy)}{n(\sum x^2) - (\sum x)^2}$$

n is the number of x,y pairs

Instructions:

- ☐ Insert comments at the top and throughout each file
  - Include the follow comments at the beginning of this (and ALL) files.
    - % your name
    - % assignment number
    - % date you completed the assignment
    - % a short narrative about what the file does
  - Use your development plan as a guide for comments throughout each file
- ☐ Use `clc` and `clear all` at the beginning of your program.
- ☐ Use descriptive variable names.
- ☐ Use Sample Input/Output as a guide.
- ☐ No extra output, i.e., use semicolons!

-5 points per file for absence of any of these required comments at the top

- ☐ Initialize the counters and accumulator.

- ☐ Loops:
  - Think carefully about what needs to be done before the loop, in the loop, and after the loop
  - Use a **sentinel loop** for entering velocities and distances.
  - Use **counting loops** when summing data and printing table.
- ☐ Printing:
  - Use **fprintf** for all output.
  - Decimal places:
    - velocity 0
    - distance 3
    - slope 4
    - y-intercept 3
  - Column numbers **right-justified**, i.e., right-aligned
  - No extra blank spaces in the other output.

New commands
`fprintf`
`input`

Revisit
using index with a vector, Ch.4
initialize counter and accumulators
sentinel loop
counting loop

***Other information*:**

- Ask the user to enter a velocity and distance pair **until zero(0) is entered for velocity**.
- Build vectors to store the velocities and distances using an **index** to assign the values in the elements.
- Count the number of pairs of velocity and distance (n) and use to control for loops later.
- Compute the sums needed to computer the slope and y-intercept.

- Print the contents of the velocity and distance vectors in a two column table with a title and column headings.
- Print slope and y-intercept in the form of a linear equation. Use the answers in your hand example to check slope and y-intercept.
- Ask the user to enter one of the velocities entered earlier and compute the distance using the linear equation that you create. Note: The distance may not be the exact value because of the limited amount of input.

Sample Input/Output:

```
Enter the velocity of a nebula(enter 0 to stop): 170
Enter the distance of a nebula: .032
Enter the velocity of a nebula(enter 0 to stop): 290
Enter the distance of a nebula: .034
Enter the velocity of a nebula(enter 0 to stop): -130
Enter the distance of a nebula: .214
Enter the velocity of a nebula(enter 0 to stop): -70
Enter the distance of a nebula: .263
Enter the velocity of a nebula(enter 0 to stop): -185
Enter the distance of a nebula: .275
Enter the velocity of a nebula(enter 0 to stop): 0

  NEBULA INPUT DATA
 VELOCITY  DISTANCE
  km/sec  106 parsecs
    170       0.032
    290       0.034
   -130       0.214
    -70       0.263
   -185       0.275

LINEAR EQUATION: distance = -0.0006 * velocity + 0.172

Enter a velocity of a nebula from above: -70
For velocity = -70, distance = 0.211
```

The values in your hand example should NOT be the ones used in the sample.

Submit via Blackboard:

`devPlan06.txt`	Software development method
`Lab06.m`	MATLAB script file