

Project 1 : CSC 24400
Standard Deviation Tutorial
Due: Sunday, January 21, 2018 at 11:59 p.m.

Description:

For your first programming assignment, you are to write a program to open and read an input file, which contains an unknown number of values, and processes the data in accordance with the instructions given below. Your program is to be modularized with functions to sort, print, and read. It is also to include any other functions you deem necessary.

INPUT:

The input file for this program consists of an unknown number of values of type float (You may assume a maximum of 100 values in the data file). Each value will be on a separate line. A non-numeric character (i.e. an alphabetic character other than '0-9' and '.') will act as the sentinel, indicating the end of input. If there are entries after the sentinel, they should be ignored by your program. The input file name will be **data1.txt**.

PROCESSING:

You are to create a web page by writing html to the output file as follows:

1. has a header, as described in the file "Program Requirements"
2. has a horizontal line spanning the entire web page
3. has a title (i.e., uses an h1 tag) of "**Standard Deviation Tutorial**" in the HTML body.
4. after the title is displayed, shows the first two rows of a table, with header and first row values as found below:

i	x_i	x_i^2	$SUM(x_i)$	$SUM(x_i^2)$
---	---	---	0	0

5. reads a value from the input file.
6. The code should then do the following in a loop until the value read from the file is an alphabetic character (i.e., not a valid floating point number):
 - Adds a corresponding row to the bottom of the table, with appropriate values for each column. For example, if the first value in the file is a 4.0, a new row should be added to the table, giving something like:

i	x_i	x_i^2	$SUM(x_i)$	$SUM(x_i^2)$	$MIN(x_i)$	$MAX(x_i)$
---	---	---	0.0	0.0	none	none
1	4.0	16.0	4.0	16.0	4.0	4.0

7. At this point, sentinel value has been read in. Suppose the file contained: 4.0, 1.3, 9.2, 7.5, 2.1, and 7.3 as values; in this case the table would look like:

i	x_i	x_i^2	$SUM(x_i)$	$SUM(x_i^2)$	MIN(x_i)	MAX(x_i)
---	---	---	0.0	0.0	none	none
1	4.0	16.0	4.0	16.0	4.0	4.0
2	1.3	1.69	5.3	17.69	1.3	4.0
3	9.2	84.64	14.5	102.33	1.3	9.2
4	7.5	56.25	22.0	158.58	1.3	9.2
5	2.1	4.41	24.1	162.99	1.3	9.2
6	7.3	53.29	31.4	216.28	1.3	9.2

8. Close the table.
9. You should then print out the following on four separate lines after the table:
- the size of this set of “sample” values (i.e., the number of actual numeric values entered).
 - the mean of these “sample” values. The mean can be calculated as:

$$\text{mean} = \frac{SUM(x_i)}{\text{size}}$$

- the variance of these “sample” values. The variance can be calculated as:

$$\text{variance} = \frac{SUM(x_i^2) - \frac{(SUM(x_i))^2}{\text{size}}}{\text{size} - 1}$$

- the standard deviation of these “sample” values. The standard deviation can be calculated as:

$$\text{standard deviation} = \sqrt{\text{variance}}$$

So, for the example table values above, you would get something like:

```
sample size is 6
sample mean is 5.233
sample variance is 10.391
sample standard deviation is 3.223
```

where all floating point values are rounded to no more than 3 digits after the decimal point.

10. has a horizontal line spanning the entire web page

11. has a footer, as described in the file “Program Requirements”

OUTPUT:

The output for this program is to be an html file containing valid HTML conforming to the processing requirements. All floating point values output should be in the correct columns of the table, or labeled as shown for the summary statistics. A message such as **END OF PROGRAM OUTPUT** must appear after all information has been printed.

SAMPLE Input: Suppose **data1.txt** looked like this:

```
4.0
1.3
9.2
7.5
2.1
7.3
C
12.6
22.1
```

Then your output should look something like this:

```
<!DOCTYPE html>
<html>
<head>
<meta charset="ISO-8859-1">
<title>Insert title here</title>
</head>
<body>
Michelle Lynn<br>
CSC 24400<br>
Section 21<br>
Spring 2018<br>
Assignment #1<br>
<hr>
<h1>Standard Deviation Tutorial</h1>
<table border="1">
<tr>
<td>i</td>
<td>x<sub>i</sub></td>
<td>x<sub>i</sub><sup>2</sup></td>
<td>SUM(x<sub>i</sub>)</td>
```

	SUM(x _i ²)	MIN(x _i)	MAX(x _i)
	---	---	---
	0.0	0.0	none
	none	none	
	1	4.0	16.0
	4.0	16.0	4.0
	4.0	4.0	16.0
	4.0	4.0	4.0
	2	1.3	17.69
	1.69	5.3	1.3
	5.3	17.69	1.3
	3	9.2	84.64
	14.5	102.33	1.3
	1.3	9.2	
	4	7.5	56.25
	22.0	158.58	1.3
	1.3		

```

        <td>9.2</td>
</tr>
<tr>
    <td>5</td>
    <td>2.1</td>
    <td>4.41</td>
    <td>24.1</td>
    <td>162.99</td>
    <td>1.3</td>
    <td>9.2</td>
</tr>
<tr>
    <td>6</td>
    <td>7.3</td>
    <td>53.29</td>
    <td>31.4</td>
    <td>216.28</td>
    <td>1.3</td>
    <td>9.2</td>
</tr>
</table>
Sample size is: 6<br>
Sample mean is: 5.233<br>
Sample variance is 10.391<br>
Sample standard deviation is 3.223<br>
<br>
<hr>
END OF PROGRAM OUTPUT
<hr>
</body>
</html>

```

When this output file is opened in a browser, it should render something like:

Michelle Lynn
CSC 24400
Section 21
Spring 2018
Assignment #1

Standard Deviation Tutorial

i	x_i	x_i^2	$SUM(x_i)$	$SUM(x_i^2)$	MIN(x_i)	MAX(x_i)
---	---	---	0.0	0.0	none	none
1	4.0	16.0	4.0	16.0	4.0	4.0

2	1.3	1.69	5.3	17.69	1.3	4.0
3	9.2	84.64	14.5	102.33	1.3	9.2
4	7.5	56.25	22.0	158.58	1.3	9.2
5	2.1	4.41	24.1	162.99	1.3	9.2
6	7.3	53.29	31.4	216.28	1.3	9.2

sample size is 6
 sample mean is 5.233
 sample variance is 10.391
 sample standard deviation is 3.223

 END OF PROGRAM OUTPUT

Additional Requirements:

You are expected to follow all of the requirements in the file “Program Requirements” as well as follow all of the guidelines in the file “Coding Guidelines” except where they conflict with the Program Requirements (which take precedence).

The only exception is that the functions header() and footer() should generate html into the output file for this project (in future projects you will use them as they are given).

Project Submission:

Create a .zip file containing your .cpp and .h files ONLY (do not include executables or object files please – these take large amounts of disk space). Submit your .zip file to the project submission tool on the Canvas course web page for this assignment. **All submissions must be received by 11:59 p.m. the day they are due in order to receive full credit.**