

Programming Project #5

EGRE245 Fall 2017

Lifetimes of Bulbs

1 Overview

A factory manufactures light bulbs, and from the production line bulbs are chosen at random to see how long they last. For quality control purposes there must be regular reports on the mean lifetime and standard deviation in hours of selected bulbs.

Write a C program that reads in batches of test data for light bulbs and then prepares a report on the mean and standard deviation for each group of bulbs. Each test batch will test from 5 to 10 bulbs for multiple companies. Batch numbers and companies are represented by unique integers. Lifetime hours for individual bulbs are reported/entered as whole numbers. All floating point data should be stored, if and where necessary, in variables of type `double`.

Here is the expected format of your data file:

```
2 ← (number of test batches)
2179 ← (batch number)
13 1002 992 979 988 1012 1005 971 992 0 ← (data for company 13)
251 1133 1058 1072 1100 1032 1101 1009 1028 993 1091 1121 0 ← (data for company 251)
3 1000 1000 1001 1002 1000 999 1000 993 0 ← (data for company 3)
91 950 950 950 950 950 950 950 950 950 0 ← (data for company 91)
0 ← (indicates end of batch)
47 ← (batch number)
14 988 980 979 988 977 984 971 982 979 0 ← (data for company 14)
15 1211 1191 1189 1199 1202 1195 1197 1200 1204 1199 0 ← (data for company 15)
482 1002 1007 1001 1002 1014 999 1003 1002 1000 996 0 ← (data for company 482)
0 ← (indicates end of batch)
```

Note that the data for each companies' bulbs begins with the company number followed by a 0-terminated list of the lifetime (in hours) of each bulb tested. You may assume there will be at least one batch and that each batch will have at least one company. Also assume data for at least 5 bulbs per company with a maximum of 10 bulbs. If more than 10 values are present in a test, just consider the first 10 bulbs in your calculations. All bulb data should be read from standard input via file redirection on the command line and be stored and accessed in your code in a one-dimensional array. Your output should match the sample run exactly.

The mean \bar{x} of a set of measurements x_i (where n equals the number of bulbs, i varies from 1 to n) is defined to be

$$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$$

and the formula for standard deviation s is

$$s = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}}$$

2 Sample Run

Sample run data:

```
2
2179
13 1002 992 979 988 1012 1005 971 992 0
251 1133 1058 1072 1100 1032 1101 1009 1028 993 1091 1121 0
3 1000 1000 1001 1002 1000 999 1000 993 0
91 950 950 950 950 950 950 950 950 950 950 0
0
47
14 988 980 979 988 977 984 971 982 979 0
15 1211 1191 1189 1199 1202 1195 1197 1200 1204 1199 0
482 1002 1007 1001 1002 1014 999 1003 1002 1000 996 0
0
```

```
Terminal — tssh — 61x36
liberty:~/cprogs/% cat bulbs1.dat
2
2179
13 1002 992 979 988 1012 1005 971 992 0
251 1133 1058 1072 1100 1032 1101 1009 1028 993 1091 1121 0
3 1000 1000 1001 1002 1000 999 1000 993 0
91 950 950 950 950 950 950 950 950 950 0
0
47
14 988 980 979 988 977 984 971 982 979 0
15 1211 1191 1189 1199 1202 1195 1197 1200 1204 1199 0
482 1002 1007 1001 1002 1014 999 1003 1002 1000 996 0
0

liberty:~/cprogs/% a.out < bulbs1.dat
Project #5, D. Resler
+-----+
| Test Batch #2179 |
+-----+
Company    Mean    Std Dev
-----
    13    992.62   13.585
   251  1061.70   45.446
     3    999.38    2.722
    91    950.00    0.000

+-----+
| Test Batch #47 |
+-----+
Company    Mean    Std Dev
-----
    14    980.89    5.395
    15  1198.70    6.343
   482  1002.60    4.904

liberty:~/cprogs/%
```

3 Deliverables

You should turn in a stand-alone, complete application program (your source code) containing a **main** function. Name your source code file **proj5XXXX.c** where **XXXX** is the last 4 digits of your student id number. For example, if your student id number is V12345678, your file will be named **proj55678.c** . Projects this term will be submitted via the web using a link off of the class web page. Be sure to document your code in the manner described in class.

Due date: Tuesday, October 31