SPI Tools - a1771526

[Link to SPI Tools Summary Data]

202X, Semester 1, Software Process Improvement, Program01

Show Project Preferences | Reload Assignment Configuration | Reload My Assignment Data | Show SPI Console

Current Phase: Planning Hide Assignment Description | Change Phase | Hide Issues To Resolve | Reload Page | Close Assignment

```
Issues that must be resolved before moving to the next phase:
The size estimate must be greater than 0
The corrected size estimate must be greater than 0
---
Please correct the PROBE Method D Time estimate, it is unrealistically small
The corrected time estimate must be greater than 0
```

Assignment Description

(Last Updated: 2019/02/10 23:02:32.213)

Program 01

Assessment

ACS Core Body of Knowledge

CBOK Areas: abstraction, design, programming, systems development.

Due Dates

The programming assignments are initially due at 11.59pm on Friday of the following teaching weeks.

Program	Teaching Week
01	2
02	3
03	4
04	5
05	6
06	7
07	8
08	9
09	10
10	11

If a programming assignment is completed late, the due date for the next programming assignment will be 11.59pm on the Friday of the next teaching week. All future programming assigments are given the same extension. **Note:** the programming assignments must be completed in order.

Marks

Programming assignments due no later than the Friday of teaching week 12 and completed on-time score 1% towards the final mark for the course and those completed late score 0.5%. All other programming assignments score 0% when completed.

All programming assignments completed before the submission of the Personal Process Review, will count towards the hurdle requirements of the course even if they receive a mark of 0.

Important note: A programming assignment will normally be considered complete when it enters phase Complete. However, if a program significantly deviates from the assignment description, even if it passes the mandatory tests, it will need to be corrected before being considered complete. This may impact the marks received for later programming assignments.

Assignment

Using the *PSP Process Script for Programs01 to 04* from the *Course Scripts, Standards and Checklists* module, write a program to calculate the mean and sample standard deviation of a set of n real numbers.

Specific Requirements

Software Tools

You must use the SPI Tools programming environment for all of the programming assignments.

Important Note: You may only use code written as part of this assignment. You may not use any code written by others or that you wrote for any other purpose.

Program Structure

Your program must:

- Read all input using class IO.
- Write all output using class IO.
- Not exit with a non-zero exit status.
- Not output NaNs or infinities.
- Handle erroneous input and any other error conditions by producing a single line of output containing "OOPS!" which is terminated by a newline character and then terminating. There must be no other output.
- Pass the acceptance tests.
- Be tested thoroughly.
- You must have a class List that implements a linked list of Number values.
- Any input that is not a number must be ignored.
- All Number values read by your program must be stored in the linked list implemented by class List.
- You may not use arrays in any part of this program.
- Format the output with 2 digits after the decimal point.

Numbers

The syntax of numbers read by programs 01, 03, 04, 05, 06, 07 and 08 is as follows:

- Square brackets [ ] indicate that the enclosed terms are optional.
- + indicates that the preceding term occurs 1 or more times.
- | indicates a choice between the terms on either side.

```
number = [sign] digit+ ['.' digit+] [eee [sign] digit+]
sign = '+' | '-'
digit = '0'-'9'
eee = 'e' | 'E'
```

Examples: 0, +3.3e-13, 42, -1.0, +45, -0.4

Mean and Standard Deviation

Overview

The mean is the average of a set of data. The average is the most common measure of location for a set of numbers. The average locates the center of the data.

Standard deviation is a measure of the spread or dispersion of a set of data. The more widely the values are spread out, the larger the standard deviation. For example, say we have two separate lists of exam results from a class of 30 students; one ranges from 31% to 98%, the other from 82% to 93%. The standard deviation would be larger for the results of the first exam.

There are two types of standard deviation, sample and population, which differ in the last step of their calculation where we divide by n - 1 or n respectively. In this course we are always working with a sample of the data and wishing to make predictions based on it. Therefore we will always use the sample standard deviation.

Using mean and sample standard deviation in the PSP

Mean and sample standard deviation are used to divide your historical size data into categories and size ranges. This will be discussed in more detail in Lectures.

Calculating mean and sample standard deviation

The formula for calculating the mean is

$$x_{avg} = \frac{\sum_{i=1}^{n} x_i}{n}$$

The formula for sample standard deviation, σ, is

$$\sigma = \sqrt{\left(\frac{\sum_{i=1}^{n} (x_i - x_{avg})^2}{n - 1}\right)}$$

where:

- Σ is the symbol for summation
- i is an index to the n numbers
- x_i is the data in the set
- n is the number of items in the set

A mean and standard deviation example

In this example we will calculate the mean and standard deviation for the data in table 3.

Table 3:

x
186
699
132
272
291
331
199
1890
788
1601

1. In this example there are 10 numbers, so n = 10.
2. We can now calculate the average for the data.

$$x_{avg} = \frac{\sum_{i=1}^{10} x_i}{10} = \frac{6389}{10} = 638.9$$

3. We can now calculate the intermediate values for the standard deviation.
   Table 4:

n	x	$(x_i - x_{avg})^2$
1	186	205,118.41
2	699	3,612.01
3	132	256,947.61
4	272	134,615.61
5	291	121,034.41
6	331	94,802.41
7	199	193,512.01
8	1890	1,565,251.21
9	788	22,230.81
10	1601	925,636.41
Total	Σ = 6389	Σ = 3,522,761.90

4. We can then complete the calculation:

$$\sigma = \sqrt{\frac{3,522,761.90}{9}}$$

$$\sigma = \sqrt{391,417.878}$$
$$\sigma = 625.633981$$

5. As the last step we can output the number in the required format: 625.63

Show Time Log | Hide Estimates | Show Tests | Show PIPs

SPI Estimates

Hide Proxy Data

TYPE	Very Small	Small	Medium	Large	Very Large
Calculation	9.36	17.25	31.81	58.63	108.08
Data	10.40	16.13	25.02	38.80	60.18
I/O	36.04	40.57	45.66	51.40	57.86
Logic	30.20	36.95	45.20	55.30	67.66
Setup	15.52	16.97	18.55	20.29	22.18
Text	15.00	26.91	48.27	86.59	155.32

Add New Estimate

Classname	Type	Size	Methods	Override	Base Program	Original	Deleted	Modified	Added	Total LOC	Estimate

SPI PROBE Data

Project Name	Phase	Size	Use?	PROBE	Corrected	Use?	Actual	Use?	Time	PROBE	Corrected	Actual	Use?

SPI PROBE Methods

Estimates	Size	Size Method	Corrected	Actual	Time Method	Method D Time	Corrected	Actual
Data	0	Method D	0	0	Method D	0	0	0
Use in Future?		Yes	Yes					Yes

Hide PROBE Calculations | Hide PROBE Graphs

PROBE Method	Size A	Time A	Size B	Time B	Size C	Time C	Size D	Time D
Estimate	0	0	0	0	0	0	0	0
Correlation	0.0000	0.0000	0.0000	0.0000				
Beta0	0.0000	0.0000	0.0000	0.0000	0	0		
Beta1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
Range (70%)	0	0	0	0				
UPI	0	0	0	0				
LPI	0	0	0	0				
Variance	0.0000	0.0000	0.0000	0.0000				
Std. Dev.	0.0000	0.0000	0.0000	0.0000