Assignment Requirements for Relative Size Table Program

Personal Software Process for Engineers

# Program Requirements

Using PSP2, write a program to calculate relative size ranges for very small, small, medium, large, and very large ranges using standard deviation of an assumed log-normal distribution of sizes.

Thoroughly test the program. Test the program using the data provided in Tables 1 and 2. Expected values are included in Table 3.

|  |  |  |
| --- | --- | --- |
| *Table 1: LOC/Method Data* | |  |
| Class Name | Class LOC | Number of Methods |
| each\_char | 18 | 3 |
| string\_read | 18 | 3 |
| single\_character | 25 | 3 |
| each\_line | 31 | 3 |
| single\_char | 37 | 3 |
| string\_builder | 82 | 5 |
| string\_manager | 82 | 4 |
| list\_clump | 87 | 4 |
| list\_clip | 89 | 4 |
| string\_decrementer | 230 | 10 |
| Char | 85 | 3 |
| Character | 87 | 3 |
| Converter | 558 | 10 |
| *Table 2: Pages Per Chapter* | |
| Chapter | Pages |
| Preface | 7 |
| Chapter 1 | 12 |
| Chapter 2 | 10 |
| Chapter 3 | 12 |
| Chapter 4 | 10 |
| Chapter 5 | 12 |
| Chapter 6 | 12 |
| Chapter 7 | 12 |
| Chapter 8 | 12 |
| Chapter 9 | 8 |
| Appendix A | 8 |
| Appendix B | 8 |
| Appendix C | 20 |
| Appendix D | 14 |
| Appendix E | 18 |
| Appendix F | 12 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Table 3: Expected Values | | | | | |
|  | VS | S | M | L | VL |
| LOC/Method | 4.3953 | 8.5081 | 16.4696 | 31.8811 | 61.7137 |
| Pgs/Chapter | 6.3375 | 8.4393 | 11.2381 | 14.9650 | 19.9280 |

# Relative Size Tables

## Using Relative Size Tables in the PSP

In the PSP, relative size tables are used to give you a framework for judging the size of new parts in your planned products. For example, if you know the sizes of all previously developed parts of a certain type, you can then better judge the likely size of a new part of that type. The standard deviation procedure described in the following section allows you to balance your estimates so they more or less conform to the normal distribution.

The medium range (M) is the area from −0.5 standard deviations to +0.5 standard deviations from the mean, as shown in Figure 1. Assuming that the data approximates a normal distribution, the likely number of parts that are within plus or minus 0.5 standard deviations of the average value is 38.3%. Following similar logic, the range percentages are as follows:

* 6.68% should be very small
* 24.17% should be small
* 38.2% should be medium
* 24.17% should be large
* 6.68% should be very large



*Figure 1: Ranges of Standard Deviations*

## Calculating a Relative Size Table Using Standard Deviation

The PROBE estimating method divides historical size data into categories that represent your kind of work. One way of doing this is based on standard deviation. First, divide your historical data into functional categories that each have at least 6 to 8 members (calculation, text, and data, for example). For each category, you can then calculate the relative size ranges for VS, S, M, L, and VL using this procedure:

1. Normalize the data by dividing the part sizes by the number of items in each part to determine the size per item. For instance, if you have size data on classes and the number of methods per class, you can calculate LOC/method for each class.
2. Next, you’ll need to log-normally transform the size per item data. This is necessary because you cannot have negative sizes, and the smaller values tend to bunch up. Log-normally transforming the data keeps all the final results positive. For each size per item value, *xi*, take the natural logarithm, ln, to give ln(*xi*).
3. Calculate the average of these *n* (number of parts in the category) logarithmic values:.
4. Calculate the variance of these values: .
5. Calculate the standard deviation: .
6. Calculate the logarithmic ranges:

ln(VS) = 

ln(S) = 

ln(M) = 

ln(L) = 

ln(VL) = 

1. Last, convert the natural log values back to their original form by calculating the anti-logarithm (calculate *e* to the power of the log value) to get the midpoints of the size ranges:

VS = 

S = 

M = 

L = 

VL = 

## Example of Calculating a Relative Size Table

In this example, we’ll calculate the relative size ranges for very small, small, medium, large, and very large ranges using standard deviation for the data in the table below.

|  |  |  |  |
| --- | --- | --- | --- |
| Class Name | Class LOC | Number of Methods | LOC/Method |
| each\_char | 18 | 3 | 6.0000 |
| string\_read | 18 | 3 | 6.0000 |
| single\_character | 25 | 3 | 8.3333 |
| each\_line | 31 | 3 | 10.3333 |
| single\_char | 37 | 3 | 12.3333 |
| string\_builder | 82 | 5 | 16.4000 |
| string\_manager | 82 | 4 | 20.5000 |
| list\_clump | 87 | 4 | 21.7500 |
| list\_clip | 89 | 4 | 22.2500 |
| string\_decrementer | 230 | 10 | 23.0000 |
| Char | 85 | 3 | 28.3333 |
| Character | 87 | 3 | 29.0000 |
| Converter | 558 | 10 | 55.8000 |

1. Divide the part sizes by the number of items in each part to determine size per item, if applicable. In this instance, the LOC/‌method is calculated for each class.
2. For each size value, *xi*, calculate the natural logarithm, ln, to give ln(*xi*).

|  |  |  |
| --- | --- | --- |
| Class Name | LOC/Method | ln(*xi*) |
| each\_char | 6.0000 | 1.7918 |
| string\_read | 6.0000 | 1.7918 |
| single\_character | 8.3333 | 2.1203 |
| each\_line | 10.3333 | 2.3354 |
| single\_char | 12.3333 | 2.5123 |
| string\_builder | 16.4000 | 2.7973 |
| string\_manager | 20.5000 | 3.0204 |
| list\_clump | 21.7500 | 3.0796 |
| list\_clip | 22.2500 | 3.1023 |
| string\_decrementer | 23.0000 | 3.1355 |
| Char | 28.3333 | 3.3440 |
| Character | 29.0000 | 3.3673 |
| Converter | 55.8000 | 4.0218 |
| Total |  | 36.4197 |

1. Calculate the average of these *n* logarithmic values: 
2. Calculate the variance of these values: 

|  |  |  |  |
| --- | --- | --- | --- |
| Class Name | LOC/Method | *ln*(*xi*) | *(ln*(*xi*)-*avg*)*2* |
| each\_char | 6.0000 | 1.7918 | 1.0196 |
| string\_read | 6.0000 | 1.7918 | 1.0196 |
| single\_character | 8.3333 | 2.1203 | 0.4641 |
| each\_line | 10.3333 | 2.3354 | 0.2173 |
| single\_char | 12.3333 | 2.5123 | 0.0836 |
| string\_builder | 16.4000 | 2.7973 | 0.0000 |
| string\_manager | 20.5000 | 3.0204 | 0.0479 |
| list\_clump | 21.7500 | 3.0796 | 0.0773 |
| list\_clip | 22.2500 | 3.1023 | 0.0905 |
| string\_decrementer | 23.0000 | 3.1355 | 0.1115 |
| Char | 28.3333 | 3.3440 | 0.2943 |
| Character | 29.0000 | 3.3673 | 0.3201 |
| Converter | 55.8000 | 4.0218 | 1.4890 |
| Total |  | 36.4197 | 5.2350 |

1. Calculate the standard deviation: 
2. Calculate the logarithmic ranges:

ln(VS) = 

ln(S) = 

ln(M) = 

ln(L) = 

ln(VL) = 

1. Convert the natural log values back to their original form by calculating the anti-logarithm. Calculate *e* to the power of the log value to determine the midpoints of the size ranges:

VS = 

S = 

M = 

L = 

VL = 

Document Markings

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