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| PSP1 Process Script | |
| Purpose | To guide the development of module-level programs |
| Entry Criteria | * Problem description * PSP1 Project Plan Summary form * ***Size Estimating template*** * ***Historical size and time data (estimated and actual)*** * Time and Defect Recording logs * Defect Type, Coding, and Size Measurement standards * Stopwatch (optional) |

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| Step | Activities | Description |
| 1 | Planning | * Produce or obtain a requirements statement. * ***Use the PROBE method to*** estimate the added and modified size of this program. * ***Complete the Size Estimating template.*** * ***Use the PROBE method to*** estimate the required development time. * Enter the plan data in the Project Plan Summary form. * Complete the Time Recording log. |
| 2 | Development | * Design the program. * Implement the design. * Compile the program, and fix and log all defects found. * Test the program, and fix and log all defects found. * Complete the Time Recording log. |
| 3 | Postmortem | Complete the Project Plan Summary form with actual time, defect, and size data. |

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| Exit Criteria | * A thoroughly tested program * Completed Project Plan Summary form with estimated and actual data * ***Completed Size Estimating template*** * ***Completed Test Report template*** * Completed PIP forms * Completed Time and Defect Recording logs |

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| PSP1 Planning Script | |
| Purpose | To guide the PSP planning process |
| Entry Criteria | * Problem description * PSP1 Project Plan Summary form * ***Size Estimating template*** * ***Historical size and time data (estimated and actual)*** * Time Recording log |

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| Step | Activities | Description |
| 1 | Program  Requirements | * Produce or obtain a requirements statement for the program. * Ensure that the requirements statement is clear and unambiguous. * Resolve any questions. |
| 2 | Size  Estimate | * ***Produce a program conceptual design.*** * ***Use the PROBE method to*** estimate the added and modified size of this program. * ***Complete the Size Estimating template and Project Plan Summary form.*** |
| 3 | Resource  Estimate | * ***Use the PROBE method to*** estimate the time required to develop this program. * Using the *To Date %* from the most recently developed program as a guide, distribute the development time over the planned project phases. |

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| Exit Criteria | * Documented requirements statement * ***Program conceptual design*** * ***Completed Size Estimating template*** * Completed Project Plan Summary form with estimated program size and development time data * Completed Time Recording log |

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| PSP1 Development Script | |
| Purpose | To guide the development of small programs |
| Entry Criteria | * Requirements statement * Project Plan Summary form with estimated program size and development time * Time and Defect Recording logs * Defect Type standard and Coding standard |

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| Step | Activities | Description |
| 1 | Design | * Review the requirements and produce a design to meet them. * Record in the Defect Recording log any requirements defects found. * Record time in the Time Recording log. |
| 2 | Code | * Implement the design following the Coding standard. * Record in the Defect Recording log any requirements or design defects found. * Record time in the Time Recording log. |
| 3 | Compile | * Compile the program until there are no compile errors. * Fix all defects found. * Record defects in the Defect Recording log. * Record time in the Time Recording log. |
| 4 | Test | * Test until all tests run without error. * Fix all defects found. * Record defects in the Defect Recording log. * Record time in the Time Recording log. * ***Complete a Test Report template on the tests conducted and the results obtained.*** |

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| Exit Criteria | * A thoroughly tested program that conforms to the Coding standard * ***Completed Test Report template*** * Completed Time and Defect Recording logs |

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| PSP1 Postmortem Script | |
| Purpose | To guide the PSP postmortem process |
| Entry Criteria | * Problem description and requirements statement * Project Plan Summary form with program size and development timedata * ***Completed Test Report template*** * Completed Time and Defect Recording logs * A tested and running program that conforms to the coding and size measurement standards |

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| --- | --- | --- |
| Step | Activities | Description |
| 1 | Defect Recording | * Review the Project Plan Summary to verify that all of the defects found in each phase were recorded. * Using your best recollection, record any omitted defects. |
| 2 | Defect Data Consistency | * Check that the data on every defect in the Defect Recording log are accurate and complete. * Verify that the numbers of defects injected and removed per phase are reasonable and correct. * Using your best recollection, correct any missing or incorrect defect data. |
| 3 | Size | * Count the size of the completed program. * Determine the size of the base, reused, deleted, modified, added, total, added and modified, and new reusable code. * Enter these data in the Project Plan Summary form. |
| 4 | Time | * Review the completed Time Recording log for errors or omissions. * Using your best recollection, correct any missing or incomplete time data. |

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| Exit Criteria | * A thoroughly tested program that conforms to the coding and size measurement standards * ***Completed Test Report template*** * Completed Project Plan Summary form * Completed PIP forms describing process problems, improvement suggestions, and lessons learned * Completed Time and Defect Recording logs |

**Example PSP1 Project Plan Summary**

|  |  |  |  |
| --- | --- | --- | --- |
| Student | U. Pranaav | Date | 01.05.2023 |
| Program | regression.py | Program # | PSP1-ex-03 |
| Instructor | Dr. K. S. Gayathri | Language | Python |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Summary*** | ***Plan*** | | |  | ***Actual*** | | |  | ***To Date*** | | |
| ***Size/Hour*** |  | | |  |  | | |  |  | | |
|  |  | | |  |  | | |  |  | | |
| **Program Size** | ***Plan*** | | |  | **Actual** | | |  | **To Date** | | |
| Base (B) | 0 | | |  | 0 | | |  |  | | |
|  | ***(Measured)*** | | |  | (Measured) | | |  |  | | |
| Deleted (D) | ***-*** | | |  | - | | |  |  | | |
|  | ***(Estimated)*** | | |  | (Counted) | | |  |  | | |
| Modified (M) | ***-*** | | |  | - | | |  |  | | |
|  | ***(Estimated)*** | | |  | (Counted) | | |  |  | | |
| Added (A) | ***-*** | | |  | - | | |  |  | | |
|  | ***(A+M − M)*** | | |  | (T − B + D − R) | | |  |  | | |
| Reused (R) | ***-*** | | |  | - | | |  | - | | |
|  | ***(Estimated)*** | | |  | (Counted) | | |  |  | | |
| Added and Modified (A+M) | ***-*** | | |  | - | | |  | - | | |
|  | ***(Projected)*** | | |  | (A + M) | | |  |  | | |
| Total Size (T) | ***210*** | | |  | 310 | | |  | 514 | | |
|  | ***(A+M + B − M − D + R)*** | | |  | (Measured) | | |  |  | | |
| Total New Reusable | - | | |  | - | | |  | - | | |
|  |  | | |  |  | | |  |  | | |
| ***Estimated Proxy Size (E)*** | 340 | | |  |  | | |  |  | | |
|  |  | | |  |  | | |  |  | | |
| **Time in Phase (min.)** | **Plan** |  | **Actual** | | |  | **To Date** | | |  | **To Date %** |
| Planning | 20 |  | 20 | | |  | 150 | | |  | 13.33 |
| Design | 10 |  | 10 | | |  | 200 | | |  | 5.00 |
| Code | 60 |  | 70 | | |  | 545 | | |  | 12.84 |
| Compile | - |  | - | | |  | - | | |  | - |
| Test | 20 |  | 20 | | |  | 225 | | |  | 8.89 |
| Postmortem | - |  | - | | |  | - | | |  | - |
| Total | 110 |  | 120 | | |  | 1120 | | |  | 10.71 |
|  |  |  |  | | |  |  | | |  |  |
| **Defects Injected** |  |  | **Actual** | | |  | **To Date** | | |  | **To Date %** |
| Planning |  |  | - | | |  | 2 | | |  | - |
| Design |  |  | - | | |  | 4 | | |  | - |
| Code |  |  | 1 | | |  | 7 | | |  | 14.29 |
| Compile |  |  | - | | |  | - | | |  | - |
| Test |  |  | - | | |  | - | | |  | - |
| Total Development |  |  | 1 | | |  | 13 | | |  | 7.69 |
|  |  |  |  | | |  |  | | |  |  |
| **Defects Removed** |  |  | **Actual** | | |  | **To Date** | | |  | **To Date %** |
| Planning |  |  | - | | |  | 2 | | |  | - |
| Design |  |  | - | | |  | 4 | | |  | - |
| Code |  |  | 1 | | |  | 7 | | |  | 14.29 |
| Compile |  |  | - | | |  | - | | |  | - |
| Test |  |  | - | | |  | - | | |  | - |
| Total Development |  |  | 1 | | |  | 13 | | |  | 7.69 |
| After Development |  |  |  | | |  |  | | |  |  |

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| PSP1 Plan Summary Instructions | |  |
| Purpose | To hold the plan and actual data for programs or program parts | |
| General | * Use the most appropriate size measure, either LOC or element count. * “To Date” is the total actual to-date values for all products developed. * ***Apart could be a module, component, product, or system.*** | |
| Header | * Enter your name and the date. * Enter the program name and number. * Enter the instructor’s name and the programming language you are using. | |
| *Summary* | * ***Enter the added and modified size per hour planned, actual, and to-date.*** | |
| Program Size | * ***Enter plan base, deleted, modified, reused, new reusable, and total size from the Size Estimating template.*** * Enter the plan added and modified size value (A+M) ***from projected added and modified size (P) on the Size Estimating template.*** * ***from the Size Estimating template***. * ***Calculate plan added size as A+M – M.*** * ***Enter estimated proxy size (E) from the Size Estimating template***. * Enter actual base, deleted, modified, reused, total, and new reusable size Calculate actual added size as T-B+D-R and actual added and modified size as A+M. * Enter to-date reused, added and modified, total, and new reusable size. | |
| Time in Phase | * Enter ***plan total time in phasefrom*** the estimated total development time ***on the Size Estimating template***. * Distribute the estimated total time across the development phases according to the To Date % for the most recently developed program. * Enter the actual time by phase and the total time. * To Date: Enter the sum of the actual times for this program plus the to-date times from the most recently developed program. * To Date %: Enter the percentage of to-date time in each phase. | |
| Defects Injected | * Enter the actual defects by phase and the total actual defects. * To Date: Enter the sum of the actual defects injected by phase and the to-date values for the most recent previously developed program. * To Date %: Enter the percentage of the to-date defects injected by phase. | |
| Defects Removed | * To Date: Enter the actual defects removed by phase plus the to-date values for the most recent previously developed program. * To Date %: Enter the percentage of the to-date defects removed by phase. * After development, record any defects subsequently found during program testing, use, reuse, or modification. | |

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| PROBE Estimating Script | |
| Purpose | To guide the size and time estimating process using the PROBE method |
| Entry Criteria | * Requirements statement * Size Estimating template and instructions * Size per item data for part types * Time Recording log * Historical size and time data |
| General | * This script assumes that you are using added and modified size data as the size-accounting types for making size and time estimates. * If you choose some other size-accounting types, replace every “added and modified” in this script with the size-accounting types of your choice. |

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| Step | Activities | Description |
| 1 | Conceptual Design | Review the requirements and produce a conceptual design. |
| 2 | Parts Additions | Follow the Size Estimating Template instructions to estimate the parts additions and the new reusable parts sizes. |
| 3 | Base Parts and Reused Parts | * For the base program, estimate the size of the base, deleted, modified, and added code. * Measure and/or estimate the side of the parts to be reused. |
| 4 | Size Estimating Procedure | * If you have sufficient estimated proxy size and actual added and modified size data (three or more points that correlate), use procedure 4A. * If you do not have sufficient estimated data but have sufficient plan added and modified and actual added and modified size data (three or more points that correlate), use procedure 4B. * If you have insufficient data or they do not correlate, use procedure 4C. * If you have no historical data, use procedure 4D. |
| 4A | Size Estimating Procedure 4A | * Using the linear-regression method, calculate theand parameters from the estimated proxy size and actual added and modified size data. * If the absolute value ofis not near 0 (less than about 25% of the expected size of the new program), oris not near 1.0 (between about 0.5 and 2.0), use procedure 4B. |
| 4B | Size Estimating Procedure 4B | * Using the linear-regression method, calculate theandparameters from the plan added and modified size and actual added and modified size data. * If the absolute value of is not near 0 (less than about 25% of the expected size of the new program), oris not near 1.0 (between about 0.5 and 2.0), use procedure 4C. |
| 4C | Size Estimating Procedure 4C | If you have any data on plan added and modified size and actual added and modified size, set= 0 and  = (actual total added and modified size to date/plan total added and modified size to date). |
| 4D | Size Estimating Procedure 4D | If you have no historical data, use your judgment to estimate added and modified size. |

**(continued)**

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| PROBE Script (continued) | | |
| Step | Activities | Description |
| 5 | Time Estimating Procedure | * If you have sufficient estimated proxy size and actual development time data (three or more points that correlate), use procedure 5A. * If you do not have sufficient estimated size data but have sufficient plan added and modified size and actual development time data (three or more points that correlate), use procedure 5B. * If you have insufficient data or they do not correlate, use procedure 5C. * If you have no historical data, use procedure 5D. |
| 5A | Time Estimating Procedure 5A | * Using the linear-regression method, calculate theand parameters from the estimated proxy size and actual total development time data. * Ifis not near 0 (substantially smaller than the expected development time for the new program), oris not within 50% of 1/(historical productivity), use procedure 5B. |
| 5B | Time Estimating Procedure 5B | * Using the linear-regression method, calculate theand regression parameters from the plan added and modified size and actual total development time data. * Ifis not near 0 (substantially smaller than the expected development time for the new program), oris not within 50% of 1/(historical productivity), use procedure 5C. |
| 5C | Time Estimating Procedure 5C | * If you have data on estimated – added and modified size and actual development time, set= 0 and  = (actual total development time to date/estimated – total added and modified size to date). * If you have data on plan – added and modified size and actual development time, set= 0 and  = (actual total development time to date/plan total added and modified size to date). * If you only have actual time and size data, set= 0 and  = (actual total development time to date/actual total added and modified size to date). |
| 5D | Time Estimating Procedure 5D | If you have no historical data, use your judgment to estimate the development time from the estimated added and modified size. |
| 6 | Time and Size Prediction Intervals | * If you used regression method A or B, calculate the 70% prediction intervals for the time and size estimates. * If you did not use the regression method or do not know how to calculate the prediction interval, calculate the minimum and maximum development time estimate limits from your historical maximum and minimum productivity for the programs written to date. |

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| Exit Criteria | * Completed estimated and actual entries for all pertinent size categories * Completed PROBE Calculation Worksheet with size and time entries * Plan and actual values entered on the Project Plan Summary |

Test Report Template

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| --- | --- | --- | --- |
| Student | U. Pranaav | Date | 01.05.2023 |
| Program | regression.py | Program # | PSP1-ex-03 |
| Instructor | Dr. K. S. Gayathri | Language | Python |

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| Test Name/Number | 4 linear regression checks. |
| Test Objective | To estimate whether the predicted values of each linear regression is accurate |
|  | to actual values. |
| Test Description | Random values of x [value for which we will need to predict] will be |
|  | generated and corresponding values of y [predicted values] will be displayed. |
|  |  |
|  |  |
|  |  |
| Test Conditions | Code of various lengths will be given as input and linear regressions will be |
|  | performed in order to get a correct prediction which we will compare and |
|  | check whether predicted value matches actual value. |
|  |  |
|  |  |
| Expected Results | Accurately predicted results which match with given observations. |
|  |  |
|  |  |
|  |  |
| Actual Results | Obtained output falls within a small range within the actual values present |
|  | In the data. |
|  |  |
|  |  |
|  |  |
| Test Name/Number |  |
| Test Objective |  |
|  |  |
| Test Description |  |
|  |  |
|  |  |
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|  |  |
| Test Conditions |  |
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| Expected Results |  |
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| Actual Results |  |
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Test Report Template Instructions

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| --- | --- |
| Purpose | * To maintain a record of the tests run and the results obtained * To be sufficiently complete so that you can later re-run the same tests and get the same results * To facilitate regression testing of modified or reused programs |
| General | * Expand this table or use multiple copies as needed. * Report all the tests that were successfully run. * Be as brief and concise as possible. |
| Header | * Enter your name and the date. * Enter the program name and number. * Enter the instructor’s name and the programming language you are using. |
| Test Name/Number | Uniquely identify each test for each program.   * the same tests with different data * the same data with different tests |
| Test Objective | Briefly describe the objective of the test. |
| Test Description | Describe each test’s data and procedures in sufficient detail to facilitate its later use as a regression test. |
| Test Conditions | * List any special configuration, timing, fix, or other conditions of the test. * When multiple tests are run with different parameters or under varying conditions, separately list each. |
| Expected Results | List the results that the test should produce if it runs properly. |
| Actual Results | List the results that were actually produced. |

Size Estimating Template

|  |  |  |  |
| --- | --- | --- | --- |
| Student | U. Pranaav | Date | 01.05.2023 |
| Program | regression.py | Program # | PSP1-ex-03 |
| Instructor | Dr. K. S. Gayathri | Language | Python |
| Size Measure |  |  |  |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Estimated | | | | | | | | | | | |
| Base Parts |  | Base | |  | Deleted | |  | Modified | | |  | Added | |
| 1. Regression parameter |  | - | |  | - | |  | - | | |  | - | |
| calculation. |  |  | |  |  | |  |  | | |  |  | |
|  |  |  | |  |  | |  |  | | |  |  | |
|  |  |  | |  |  | |  |  | | |  |  | |
| Total | B | | 210 | D | | - | M | | - | **BA** | | | - |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Actual | | | | | | | | | | |
| Base Parts |  | Base | |  | Deleted | |  | Modified | |  | Added | |
|  |  |  | |  |  | |  |  | |  |  | |
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| Total |  | |  |  | |  |  | |  |  | |  |

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|  |  | Estimated | | | | | | | |  | Actual | | |
| Parts Additions |  | Type |  | Items |  | Rel. Size | |  | Size\* |  | Size\* |  | Items |
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| Total |  |  |  |  |  |  | PA | |  |  |  |  |  |

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| --- | --- | --- | --- | --- | --- |
|  | |  | Estimated |  | Actual |
| Reused Parts | |  | Size |  | Size |
|  | |  |  |  |  |
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|  | |  |  |  |  |
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|  | |  |  |  |  |
|  | |  |  |  |  |
| Total | R | |  |  |  |

**(continued)**

Size Estimating Template (continued)

|  |  |  |  |
| --- | --- | --- | --- |
| Student | U. Pranaav | Program | PSP1-ex-03 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| PROBE Calculation Worksheet (Added and Modified) |  | Size |  | Time |
| Added size (A): A = BA+PA |  | - |  |  |
| Estimated Proxy Size (E): E = BA+PA+M |  | 210 |  |  |
| PROBE estimating basis used: (A, B, C, or D) |  | B |  | B |
| Correlation: (R2) |  | 0.911 |  | 0.871 |
| Regression Parameters: β0 Size and Time |  | -22.55 |  | -4.04 |
| Regression Parameters: β1 Size and Time |  | 1.73 |  | 0.17 |
| Projected Added and Modified Size (P): P = β0size + β1size\*E |  | 340 |  |  |
| Estimated Total Size (T): T = P + B - D - M + R |  | 340 |  |  |
| Estimated Total New Reusable (NR): sum of \* items |  | - |  |  |
| Estimated Total Development Time: Time = β0time + β1time\*E |  |  |  | 31 |
| Prediction Range: Range |  | 10 |  | 3 |
| Upper Prediction Interval: UPI = P + Range |  | 350 |  | 28 |
| Lower Prediction Interval: LPI = P - Range |  | 330 |  | 34 |
| Prediction Interval Percent: |  |  |  |  |

Size Estimating Template Instructions

|  |  |
| --- | --- |
| Purpose | Use this form with the PROBE method to make size estimates. |
| General | * A part could be a module, component, product, or system. * Where parts have a substructure of methods, procedures, functions, or similar elements, these lowest-level elements are called items. * Size values are assumed to be in the unit specified in size measure. * Avoid confusing base size with reuse size. * Reuse parts must be used without modification. * Use base size if additions, modifications, or deletions are planned. * If a part is estimated but not produced, enter its actual values as zero. * If a part is produced that was not estimated, enter it using zero for its planned values. |
| Header | * Enter your name and the date. * Enter the program name and number. * Enter the instructor’s name and the programming language you are using. * Enter the size measure you are using. |
| Base Parts | If this is a modification or enhancement of an existing product   * measure and enter the base size (more than one product may be entered as base) * estimate and enter the size of the deleted, modified, and added size to the base program   After development, measure and enter the actual size of the base program and any deletions, modifications, or additions. |
| Parts Additions | If you plan to add newly developed parts   * enter the part name, type, number of items (or methods), and relative size * for each part, get the size per item from the appropriate relative size table, multiply this value by the number of items, and enter in estimated size * put an asterisk next to the estimated size of any new-reusable additions   After development, measure and enter   * the actual size of each new part or new part items * the number of items for each new part |
| Reused Parts | If you plan to include reused parts, enter the   * name of each unmodified reused part * size of each unmodified reused part   After development, enter the actual size of each unmodified reused part. |

PROBE Calculation Worksheet Instructions

|  |  |
| --- | --- |
| Purpose | Use this form with the PROBE method to make size and resource estimate calculations. |
| General | The PROBE method can be used for many kinds of estimates. Where development time correlates with added and modified size   * use the Added and Modified Calculation Worksheet * enter the resulting estimates in the Project Plan Summary * enter the projected added and modified value (P) in the added and modified plan space in the Project Plan Summary   If development time correlates with some other combination of size-accounting types   * define and use a new PROBE Calculation Worksheet * enter the resulting estimates in the Project Plan Summary * use the selected combination of size accounting types to calculated the projected size value (P) * enter this P value in the Project Plan Summary for the appropriate plan size for the size-accounting types being used |
| PROBE Calculations: Size (Added and Modified) | * Added Size (A): Total the added base code (BA) and Parts Additions (PA) to get Added Size (A). * Estimated Proxy Size (E): Total the added (A) and modified (M) sizes and enter as (E). * PROBE Estimating Basis Used: Analyze the available historical data and select the appropriate PROBE estimating basis (A, B, C, or D). * Correlation: If PROBE estimating basis A or B is selected, enter the correlation value (R2) for both size and time. * Regression Parameters: Follow the procedure in the PROBE script to calculate the size and time regression parameters (β0 and β1), and enter them in the indicated fields. * Projected Added and Modified Size (P): Using the size regression parameters and estimated proxy size (E), calculate the projected added and modified size (P) as P = \*E. * Estimated Total Size (T): Calculate the estimated total size as T = P+B-D-M+R. * Estimated Total New Reusable (NR): Total and enter the new reusable items marked with \*. |
| PROBE Calculations: Time (Added and Modified) | * PROBE Estimating Basis Used: Analyze the available historical data and select the appropriate PROBE estimating basis (A, B, C, or D). * Estimated Total Development Time: Using the time regression parameters and estimated proxy size (E), calculate the estimated development time as Time = \*E. |
| PROBE Calculations: Prediction Range | * Calculate and enter the prediction range for both the size and time estimates. * Calculate the upper (UPI) and lower (LPI) prediction intervals for both the size and time estimates. * Prediction Interval Percent: List the probability percent used to calculate the prediction intervals (70% or 90%). |
| After Development (Added and Modified) | Enter the actual sizes for base (B), deleted (D), modified (M), and added base code (BA), parts additions (PA), and reused parts (R). |