

Week 1 Lab

TCO 1: Given a simple problem, design and desk-check a solution that is expressed in terms of pseudocode, flowchart, and/or input-process-output (IPO) diagrams.

**Lab**

This exercise will cover the steps used to create a solution. You will use variable lists, IPO charts, pseudocode, flowcharts, and desk-checking.

**Rubric**

Point distribution for this activity:

|  |  |  |
| --- | --- | --- |
| **Lab Activity** | | |
| **Document** | **Points possible** | **Points received** |
| Part 1 | 10 |  |
| Part 2 | 10 |  |
| Part 3 | 10 |  |
| Part 4 | 10 |  |
| Part 5 | 10 |  |
| **Total points** | **50** |  |

**Problem**

You have an idea for a restaurant tip calculator app that you want to develop for use on your mobile phone when you go out to eat. You can enter the amount of the check before taxes, the tax rate, and the tip percentage. It should display the amount before taxes, the dollar amount of the taxes, the dollar amount of the tip (calculated on amount before taxes), and the total amount including taxes and tip.

**(1) Variable List With Data Type**

List all the variables you will use (use valid variable names). Indicate whether the data type is string, integer, or decimal, and so on.

Declare Integer *taxRate*

Declare Real *tipAmount*

Declare Real *taxAmount*

Declare Integer *tipPercentage*

Declare Real *checkAmountBeforeTaxes*

Declare Real Total

**(2) IPO Model**

List the inputs, any processes, calculations, and outputs. Use the same valid variable names you used in Step 1.

|  |  |  |
| --- | --- | --- |
| Inputs | Process (calculations) | Outputs |
| *taxRate*  *checkAmountBeforeTax*  *tip Percentage*  *checkAmountBeforeTax*    *taxAmount*  *tipAmount*  *checkAmountBeforeTax* | *taxRate \* checkAmountBeforeTax*  *tipPercentage \* checkAmountBeforeTax*  *checkAmountBeforeTax*  *+tipAmount*  *+taxAmount* | *taxAmount*  *tipAmount*  Total |

**Hints:** (1) While it is true that some additional string literal messages (those that don’t incorporate variables into the expression) are outputs of the program, you instructor does not require these to be listed in the Outputs of the IPO table. It would not be “wrong” to do so, but these are not usually helpful as a design document. A programmer looking at the IPO table will primarily be concerned with outputs that involve variable expressions. (2) Your instructor does not require you to express the full logic details of your processes in the Process section of the IPO table. A descriptive, unambiguous phrase will suffice. A programmer using this as a guide can easily look at your flowchart, pseudocode, or actual code to see the details of a calculation. If a calculation is particularly complex or hard to follow, you may add some additional brief, explanatory comments. (3) Do not forget that input variables may also appear as output variables as well, as *salesPrice* does in this example. Be sure to list the variable as both an input AND output in this situation.

**(3) Pseudocode**

Describe your solution using pseudocode. Use the same valid variable names you selected in Step 1.

Start

Input *taxRate, tipAmount, taxAmount, tipPercentage, checkAmountBeforeTax*

*taxRate \* checkAmountBeforeTax*

Display “*taxAmount”*

*tipPercentage \* CheckBeforeTax*

Display “*tipAmount”*

*checkAmountBeforeTax*

*+tipAmount*

*+taxAmount*

Display “Total*”*

Stop

**(4) Flowchart**

Use MS Visio to create a flowchart. Paste the flowchart here, or attach as separate document. Use the same valid variable names you used in Step 1.

Calc tax amount >Calc tip amount>Calc Total>End

Input *taxRate, tipPercentage, checkAmountBeforeTax,*

*taxRate \* checkAmountBeforeTax*

Display “*taxAmount”*

*tipPercentage \* CheckAountBeforeTax*

Display “*tipAmount”*

*checkAmountBeforeTax + tipAmount + taxAmount*

Display “Total”

**(5) Desk-Check**

Desk-check your solution using the following sample data:

Amount of check before taxes: $28.50

Tax rate: 6%

Tip percentage: 18%

Enter the expected outputs.

Expected total tax amount $1.71

Expected total tip amount $5.13

Expected total including tax and tip $35.34

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Step** | **Variables (write variable names in first line below)** | | | | | |
| Enter step numbers | *checkAmountBeforeTax* | *taxRate* | *tipPercentage* | *taxAmount* | *tipAmount* | Total | output |
| 1 | $28.50 |  |  |  |  |  |  |
| 2 | $28.50 |  |  |  |  |  |  |
| 3 | $28.50 | 6% |  |  |  |  |  |
| 4 | $28.50 | 6% | 18% |  |  |  |  |
| 5 | $28.50 | 6% | 18% | $1.71 |  |  | $1.71 |
| 6 | $28.50 | 6% | 18% | $1.71 | $5.13 |  | $5.13 |
| 7 | $28.50 | 6% | 18% | $1.71 | $5.13 | $35.34 | $35.34 |
| 8 |  |  |  |  |  |  |  |
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| 13 |  |  |  |  |  |  |  |
| 14 |  |  |  |  |  |  |  |
| 15 |  |  |  |  |  |  |  |
| 16 |  |  |  |  |  |  |  |
| 17 |  |  |  |  |  |  |  |
| 18 |  |  |  |  |  |  |  |