Lab 3 – Algorithms

Complete the problem solving process discussed in class for each of the five problems below.

You should submit written evidence of the process in the form of:

a. A list of assumptions you've made to clarify the problem
b. An IPO chart
c. An algorithm (in pseudocode)
d. Documentation of your testing (a desk check chart).

Practice with Sequence

1. Write an algorithm that converts a decimal number between 0 and 15 into its 4 bit unsigned binary representation.

2. Write an algorithm that converts a linear measurement in feet and inches into meters. One inch is equivalent to 2.54 centimeters.

Practice with Selection

3. Write an algorithm that can be used to calculate the commission earned in a real estate transaction. The chart below describes the formulas used to calculate the commission.

Sales Price	Commission
Less than $100,000	5% of Sales Price
$100,000 to $300,000	$5,000 + 10% of Sales Price over $100,000
More than $300,000	$25,000 + 15% of Sales Price over $300,000

4. Write an algorithm that can be used to calculate car insurance rates. Rates for male drivers and young female drivers are determined by adding a surcharge to the rate for female drivers over age 25.

	Older than 25	25 or younger
Male	7% more than base rate	10% more than base rate
Female	Base rate	5% more than base rate

5. Write an algorithm that allows the user to play “Rock, Paper, Scissors” against the computer. The user should enter R, P or S. The computer will then generate a random number – 1 means Rock, 2 means Paper, 3 means Scissors. The computer will then display a message describing the user and the computer choice as well as who won.

Submit a single file containing all of your answers to moodle. This file can be in .doc, .docx (Word) or .rtf (WordPad) format. Don't worry too much about making pretty tables.

Examples and Tips

IPO Chart

For the IPO charts you don't necessarily need to use a table. You can list the three sections one above the other on the page.

IPO Chart Example:

Input
FirstNumber
SecondNumber

Processing
Get numbers to ad
Add number
Display sum

Output
Sum

Algorithm

If you list your solution steps with numbers for each step, it will make it easier to write your chart for testing the solution.

Algorithm Example:

1. Prompt operator for firstNumber
2. Get FirstNumber
3. Prompt operator for secondNumber
4. Get secondNumber
5. result = firstNumber + secondNumber
6. Display result

Test Data
When you show how you tested your solution (desk checking) you need to make sure that everything is organized in a chart. If you know how to make tables, this is the easiest way to organize your chart. Otherwise, you can use tabs. Just make sure you keep your columns straight.

Test Data Example:

firstNumber	secondNumber	result
7	9	16
0	10	10

Desk Check
You only need to run a desk check for one of the data sets.

Desk Check Example:

Step	firstNumber	secondNumber	result
1			
2	7		
3	7		
4	7	9	
5	7	9	16
6	7	9	16 display