**IT 1090C Computer Programming I   
Lab 2 – Flow Charts and Pseudo Code Conditionals  
SPRING 2020  
Pts 12 / 3 extra**

**Mini-lecture:**  
We use pseudo code and flow charts to capture the logic of a program prior to implementing it with code. In general practice, flow charts are too cumbersome for large programs and so they are mainly used for isolated sub-routines, etc. We use pseudo code all the time. The actual pseudo code can become documentation for the written program by converting the pseudo code statements to programming comments.

Note that we are refining our pseudo code here by adding the **class** and **main** sections and declaring the variables that we will use in our program and specifying their type (**num, boolean, or String**).

This will transition us nicely into programming with java.  
  
**Class** is the outer most container element for the pseudo code. You will see as we get into java that a class is implemented as a file. The name of the class will match the name of the java file: MyClass will be in MyClass.java.  
  
There are two types of classes. The **main class** is the class that contains the special method (called **main**) that is run when the program is executed. Every java program must have a main class. A **model** or **object** class defines objects that we can use in our programs. You can’t run a model class. (We will do more with model classes later in the next course. For now, when we start java we will only have main classes.)  
  
Note the pseudo code syntax. The entire program is in a container **class … end class**. In a main class, the main method is **main() … return** and all the code statements for the program are located there. The main() … return block corresponds to and replaces the **start** and **end** statements that we used previously and the entire block is now in a class. Note how we indent our blocks.  
  
**class ClassName  
 main()** // this was **start** //code goes here for our programs **return** // this was **end  
end class**  
  
Also, let’s begin to further refine our pseudo code to be specific about communication with our program users. So, every time we get input we will prompt the user like this. (I’ve actually had you do that from the beginning!) :  
  
**num birthMonth** // declare a variable called birthMonth and specify that it holds a number  
**output “Enter your birth month [1 – 12] ”** // prompt the user for the input **input birthMonth** // get the input and store it in birthMonth   
The pseudo code on the slides occasionally to save space will do multiple inputs on one line like this:  
**input birthDay, birthMonth, birthYear**   
DON”T DO THIS!

Do one input per line and have a separate prompt for each. This is how you have to get the inputs in the Java code so it will help to do it this way in the pseudocode.

Here is an example of the code we did previously on the board in class for doubling a number using our new pseudo code conventions:

**class DoubleMyFun  
 main()  
 // Declare variables (this is a comment)  
 num valueToDouble  
 num doubledValue  
 // Prompt and input  
 output “Enter the number you want to double”  
 input valueToDouble  
 // Process  
 doubledValue = valueToDouble \* 2  
 // Output  
 output “The value you entered “ + valueToDouble + “ doubled is “ + doubledValue  
 return  
end class**

Variables:   
  
We add some more details to our pseudocode and include variable declarations.   
  
num yearOfBirth // a number variable  
String ynChoice // a String variable to hold the user response to ‘Yes or No?’  
boolean isRaining // a boolean which is either true or false  
  
We put our declarations at the top of the block immediately after the main() (see in the example pseudocode immediately above!)  
  
Note that you only declare the type of the variable one time when you declare it. After that you only refer to the variable by its name:  
  
**num myAge = 61**

**print myAge**  
  
Mentioning the type again is an error because you are re-declaring a variable that already exists.

Conditional Structures:

So far, our programs have been pretty simple, now we are going to add conditional processing to our skill set.

Simple If:

**if BOOLEAN EXPRESSION then  
 statement(s)  
end if**

If Then Else:

**if BOOLEAN EXPRESSION then  
 statement(s)  
else   
 alternate statement(s)  
end if**

Cascaded If:

**if BOOLEAN EXPRESSION then  
 statement(s)  
else if BOOLEAN EXPRESSION then  
 alternate statement(s)  
else if BOOLEAN EXPRESSION then  
 alternate statement(s)  
else if BOOLEAN EXPRESSION then  
 alternate statement(s)  
…..**

**else // see how there is no test here? This is every other case.  
 alternate statement(s)**

**end if // or endIf**

**Lab:**

1. Just submit this document (See directions below.) and insert your work here.
2. For each of the following tasks, provide the complete pseudo code. Include the new pseudo code elements: class … end class, main … return, user prompts, and declare all variables that the program needs. **You don’t have to give me the Flow Charts except for one case indicated below!** Declare String variables with **String** (capital S) since that’s what we do in java. We also have **num** and **boolean** variables in pseudocode. Declare all the variables at the top of the code block within main()… return. That is immediately after main().  
   1. **Task 1 (2 pt): A program that converts a temperature in F that the user provides and returns the equivalent temperature in C. Hint: Google is your friend! Given F, solve for C. This program does not require an if structure and has a straight forward input – process – output structure!**

class FtoC

main()

// define vars

num valueToConvert

num convertedValue

// prompt and input

output “Input a temperature in Fahrenheit that you wish to convert to Celsius: ”

input valueToConvert

// process

convertedValue = (valueToConvert – 32) \* 5/9

// output

output valueToConvert + “ converted to Celsius is ” + convertedValue + “ degrees C”

return

end class

* 1. **Task 2 (2 pts): As people pass through an entry kiosk at the theater, they are prompted to enter their age. If they are 21 or older, they get a paper wrist band. Code a logic program that asks the user to enter their age and then if they are 21 or over displays a message that they get a wrist band. (Note that the program does nothing if they are not 21 or over…)**

class Wristband

main()

num age

output “Enter your age: ”

input age

if age >= 21 then

output “You get a paper wristband!”

end if

return

end class

* 1. **Task 3 (3 pts) : an application program where the user enters the price of an item and the program computes shipping costs. If the item price is $100 or more, then shipping is free otherwise it is 2% of the price. The program should output the shipping cost and the total price.  
     Submit the FlowChart for this Task 3 along with the pseudocode.**

class ShippingCost

main()

num price

num shippingCost

num priceWithShipping

output “Input the price of the item: ”

input price

if price < 100 then

output “Shipping is free ($0) for this product so your total is $” + price

else

shippingCost = price \* 0.02

priceWithShipping = price + shippingCost

output “Shipping is $” + shippingCost + “ which gives you a total of $” + priceWithShipping + “ for this product.”

end if

return

end class

**output “Shipping is free for this product so your total is $” + price**

**output “Shipping is $” + shippingCost + “ which gives you a total of $” + priceWithShipping + “ for this product.”**

**priceWithShipping = price + shippingCost**

**shippingCost = price \* 0.02**

**false**

**true**

**price < 100**

**input price**

**output “Input the price of the item: ”**

* 1. **Task 4 (3pts): A program that asks the user to enter their birth month (integer 1 – 12 inclusive). If the user enters a value in range, the program echoes the input (“Your birth month is: N”) but if the value is not in the range it outputs an error msg (“You entered an incorrect month value: N”). Assume that the user can only enter numbers here.**

class BirthMonth

main()

num birthMonth

output “Enter your birth month [1-12]: ”

input birthMonth

if birthMonth > 0 && birthMonth < 13 then

output “Your birth month is: ” + birthMonth

else

output “You entered an incorrect month value: ” + birthMonth

end if

return

end class

* 1. **Task 5 (3 pts): (This task uses Strings and an if..then..elseif cascade) A program that prompts the user for their party affiliation (Democrat, Republican, or Independent) and responds accordingly with a Donkey, Elephant, or Man. (i.e. “You get a Democratic Donkey.”)**

class PartyAffiliation

main()

String partyAffiliation

output “Please enter your party affiliation [Democrat, Republican, Independent]: ”

input partyAffiliation

if partyAffiliation == “Democrat” then

output “You get a Democratic Donkey.”

else if partyAffiliation == “Republican” then

output “You get a Republican Elephant.”

else if partyAffiliation == “Independent” then

output “You get an Independent Man.”

else

output “You did not enter a valid option.”

end if

return

end class

* 1. **Task 6 (3pts): (Extra Credit): A program that takes two inputs and compares them. And indicates if they are equal or if they are not indicates the one that is less. (Assume inputs are simple integers although that is not required and we could have any object that could be compared in this fashion.)**

class ComparingMachine

main()

// define vars

num obj1

num obj2

// prompt and input

output “Enter an object: ”

input obj1

output “Enter another object: ”

input obj2

// process and output

if obj1 == obj2 then

output “The two objects are equal.”

else if obj1 < obj2 then

output obj1 + “ is the smaller of the two objects.”

else if obj2 < obj1 then

output obj2 + “ is the smaller of the two objects.”

end if

return

end class

1. Submitting your work: carefully check your work. Rename your word file as **Lab02\_Lastname\_Firstname.docx** using your name. Submit this file using the Canvas assignment mechanism. Submit the exact same file a second time using the additional Canvas link for the extra credit option.