Summer of 2017.

Grocery Store Inventory System

Final Project
Milestone 2 V1.0

In a grocery store, in order to be able to always have the proper number of items available on shelves, an inventory system is needed to keep track of items available in the inventory and make sure the quantity of the items does not fall below a specific count.

Your job for this project is to prepare an application that manages the inventory of items needed for a grocery store. The application should be able to keep track of the following information about an item:

1- The SKU number
2- The name (maximum of 20 chars)
3- Quantity (On hand quantity currently available in the inventory)
4- Minimum Quantity (if the quantity of the item falls less than or equal to this value, a warning should be generated)
5- Price of the item
6- Is the item Taxed

This application must be able to do the following tasks:

1- Print a detailed list of all the items in the inventory
2- Search and display an item by its SKU number
3- Checkout an item to be delivered to the shelf for sale
4- Add to stock items that are recently purchased for inventory (add to their quantity)
5- Add a new item to the inventory or update an already existing item

PROJECT DEVELOPMENT PROCESS

To make the development of this application fun and easy, the tasks are broken down into several functions that are given to you from very easy ones to more complicated one by the end of the project

Since you act like a programmer in this project, you do not need to know the big picture. The professor is your system analyst and designs the system and all its functions to work together in harmony. Each milestone is divided into a few functions. For each function, firstly, understand the goal of the function. Secondly, write the code for it and test it with the tester. Once your code for the function passes the test, set it aside and pick up the next function. Continue until the milestone is complete.

The Development process of the project is divided into four milestones and therefore four deliverables. All four deliverables are mandatory and conclude full submission of the project. For each deliverable, a tester program (also called a unit test) will be provided to you to test your functions. If the tester works the way it is supposed to do, you can submit that milestone and start the next. The approximate schedule for deliverables is as follows

- The UI Tools and app interface Due July 4th
- The Item IO Due July 13th
- Item Storage and Retrieval in Array Due July 25nd
- File IO and final assembly Due Aug. 9th

FILE STRUCTURE OF THE PROJECT

For each milestone, two source files are provided under the name 144_msX_tester.c and 144_msX.c.
144_msX_tester.c includes the main() tester program provided by your professor to test your implementation of the functions of the project. (Replace X with the milestone number from 1 to 5) This main program acts like a tester (a unit test) that simply makes different calls to the functions you have written to make sure they work properly.

Code your functions in 144_msX.c test them one by one using the main function provided. You can comment out the parts of the main program for which functions are not developed yet. You are not allowed to change the code in tester. Make sure you do not make any modifications in the tester since at the time of submission the original copy of the tester will be used for compilation automatically by the submit command.

MARKING:

Please follow this link for marking details:
https://scs.senecac.on.ca/~ipc144/dynamic/assignments/Marking_Rubric.pdf

MILESTONE 1: THE USER INTERFACE TOOLS AND APP INTERFACE

Download or Clone milestone 1 (**MS1**) from https://github.com/Seneca-144100/IPC-Project

In 144_msX.c code the following functions:

USER INTERFACE TOOLS

```
void welcome(void);
```

Prints the following line and goes to newline

```
>---=== Grocery Inventory System ===---<
```

```
void printTitle(void);
```

Prints the following two lines and goes to newline

```
>Row |SKU| Name               | Price  |Taxed| Qty | Min |   Total    |Atn<
>----+---+--------------------+--------+-----+-----+-----+------------|---<
```

```
void printFooter(double gTotal);
```

Prints the following line and goes to newline

```
>-------------------------------------------------------+----------------<
```

Then if gTotal is greater than zero it will print this line: (assuming gTotal is 1234.57) and go to new line.

```
>                                          Grand Total: |     1234.57<
```

Use this format specifier for printing gTotal : **%12.2lf**

```
void flushKeyboard(void);
```

"clear Keyboard" Makes sure the keyboard is clear by reading from keyboard character by character until it reads a new line character.

*Hint: In a loop, keep reading single characters from keyboard until newline character is read (**'\n'**). Then, exit the loop*.

```
void pause(void);
```

Pauses the execution of the application by printing a message and waiting for user to hit <ENTER>.

Print the following line and DO NOT go to newline:

```
>Press <ENTER> to continue...<
```

Then, call flushKeyboard function.

Here the flushKeyboard function is used for a fool-proof <ENTER> key entry.

```
int getInt(void);
```

Gets a valid integer from the keyboard and returns it. If the integer is not valid it will print:

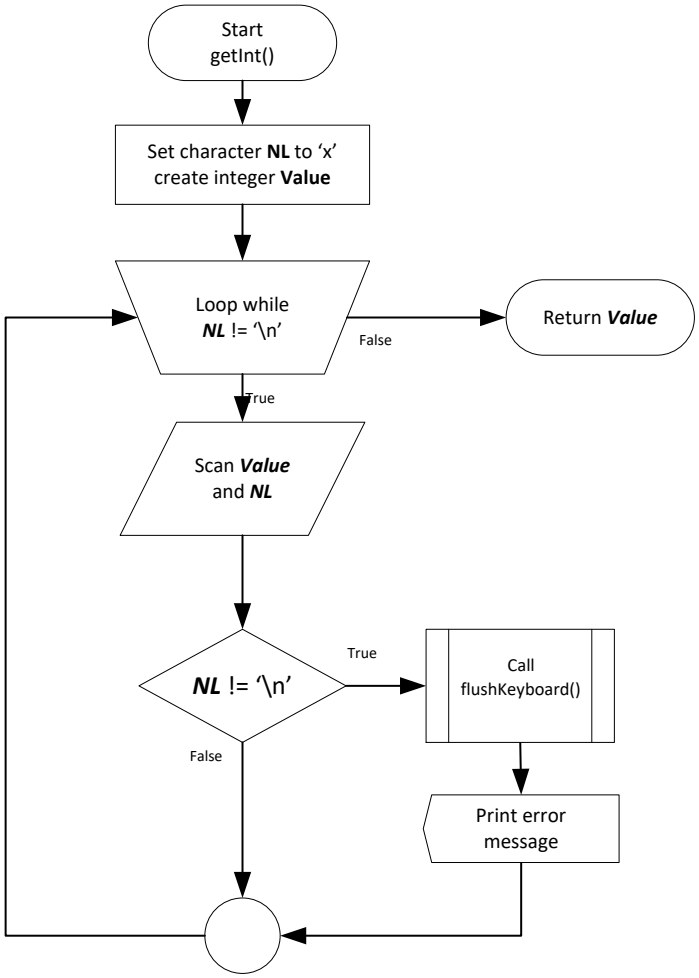
```
"Invalid integer, please try again: "
```

and try again.

This function must be fool-proof; it should not let the user pass, unless a valid integer is entered.

Hint: to do this, you can have two variables read back to back by scanf; an integer and then a character (`"%d%c"`) and make sure the second (the character) is new line. If the second character is new line, then this guaranties that first integer is successfully read and also after the integer <ENTER> is hit. If the character is anything but new line, then either the user did not enter an integer properly, or has some additional

characters after the integer, which is not good. In this case clear the keyboard, print an error message and scan the integer again. See the flowchart below.




```
int getIntLimited(int lowerLimit, int upperLimit);
```

This function uses getInt() to receive a valid integer and returns it. This function makes sure the integer entered is within the limits required (between ***lowerLimit*** and ***upperLimit*** inclusive). If the integer is not within the limits, it will print:
> `"Invalid value, TheLowerLimmit < value < TheUpperLimit: "` <
and try again. *(Change the lower and upper limit with their values.)*

This function is fool-proof too; the function will not let the user pass until a valid integer is received based on the lower and upper limit values.

```
double getDouble(void);
```

Works exactly like ***getInt()*** but scans a double instead of an integer with the following error message:
`"Invalid number, please try again: "`

```
double getDoubleLimited(double lowerLimit, double upperLimit);
```

Works exactly like ***getIntLimited()*** but scans a double instead of an integer.

OUTPUT SAMPLE:

(UNDERLINED, *ITALIC* **BOLD** RED VALUES ARE USER ENTRIES)

```
---=== Grocery Inventory System ===---

listing header and footer with grand total:
Row |SKU| Name               | Price  |Taxed| Qty | Min |   Total    |Atn
----+---+--------------------+--------+-----+-----+-----+------------|---
-------------------------------------------------------+----------------
                                          Grand Total: |     1234.57
listing header and footer without grand total:
Row |SKU| Name               | Price  |Taxed| Qty | Min |   Total    |Atn
----+---+--------------------+--------+-----+-----+-----+------------|---
-------------------------------------------------------+----------------
Press <ENTER> to continue... <ENTER>
Enter an integer: abc
Invalid integer, please try again: 10abc
Invalid integer, please try again: 10
You entered: 10
Enter an integer between 10 and 20: 9
Invalid value, 10 < value < 20: 21
Invalid value, 10 < value < 20: 15
Your entered 15
Enter a floating point number: abc
Invalid number, please try again: 2.3abc
Invalid number, please try again: 2.3
You entered: 2.30
Enter a floating point number between 10.00 and 20.00: 9.99
Invalid value, 10.000000< value < 20.000000: 20.1
Invalid value, 10.000000< value < 20.000000: 15.05
You entered: 15.05
End of tester program for IO tools!
```

THE APPLICATION USER INTERFACE SKELETON

Now that the user interface tools are created and tested, we are going to build the main skeleton of our application. This application will be a menu driven program and will work as follows:

1- When the program starts the title of the application is displayed.

2- Then a menu is displayed.
3- The user selects one of the options on the Menu.
4- Depending on the selection, the corresponding action will take place.
5- The Application will pause to attract the user's attention
6- If the option selected is not Exit program, then the program will go back to option 2
7- If the option selected is Exit program, the program ends.

The above is essentially the pseudo code for any program that uses a menu driven user interface.

To accomplish the above create the following three functions:

```
int yes(void)
```

Receives a single character from the user and then clears the keyboard (`flushKeyboard()`). If the character read is anything other than "Y", "y", "N" or "n", it will print an error message as follows:

```
>Only (Y)es or (N)o are acceptable: <
```

and goes back to read a character until one of the above four characters is received. Then, it will return 1 if the entered character is either "y" or "Y", otherwise it will return 0.

```
int menu(void)
```

Menu prints the following options:

```
><
>1- List all items<
>2- Search by SKU<
>3- Checkout an item<
>4- Stock an item<
>5- Add new item or update item<
>6- Delete item<
>7- Search by name<
>0- Exit program<
>> <
```

Then, it receives an integer between 0 and 7 inclusive and returns it. Menu will not accept any number less than 0 or greater than 7 (Use the proper UI function written in the UI tools).

```
void GroceryInventorySystem(void)
```

This function is the heart of your application and will run the whole program.

GroceryInventorySystem, first, displays the welcome message and skips a line and then displays the menu and receives the user's selection.

If user selects 1, it displays:
>List Items under construction!< and goes to newline

If user selects 2, it displays:
>Search Items under construction!< and goes to newline

If user selects 3, it displays:
>Checkout Item under construction!< and goes to newline

If user selects 4, it displays:
>Stock Item under construction!< and goes to newline

If user selects 5, it displays:
>Add/Update Item under construction!< and goes to newline

If user selects 6, it displays:
>Delete Item under construction!< and goes to newline

If user selects 7, it displays:
>Search by name under construction!< and goes to newline

After receiving a number between 1 and 7, it will pause the application and goes back to display the menu.

If user selects 0, it displays:
>Exit the program? (Y)es/(N)o): <
and waits for the user to enter “Y”, ”y”, “N” or “n” for Yes or No.
If the user replies Yes, it will end the program, otherwise it goes back to display the menu.

The following is a general pseudo code for a menu driven user interface. Using this pseudo code is optional. You can use any other logic if you like.

```
Application user interface pseudo code:
while it is not done
   display menu
   get selected option from user
   check selection:
      option one selected
         act accordingly
      end option one
      option two selected
         act accordingly
      end option two
      .
      .
      Exit is selected
         program is done
      end exit
   end check
end while
```

OUTPUT SAMPLE:

(UNDERLINED, *ITALIC* **BOLD** RED VALUES ARE USER ENTRIES)

```
---=== Grocery Inventory System ===---

1- List all items
2- Search by SKU
3- Checkout an item
4- Stock an item
5- Add new item or update item
6- Delete item
7- Search by name
0- Exit program
> 8
Invalid value, 0 < value < 7: 1
List Items under construction!
Press <ENTER> to continue...
1- List all items
2- Search by SKU
3- Checkout an item
4- Stock an item
5- Add new item or update item
6- Delete item
7- Search by name
0- Exit program
> 2
Search Items under construction!
Press <ENTER> to continue...
1- List all items
2- Search by SKU
3- Checkout an item
4- Stock an item
5- Add new item or update item
6- Delete item
7- Search by name
0- Exit program
> 3
Checkout Item under construction!
Press <ENTER> to continue...
1- List all items
2- Search by SKU
3- Checkout an item
4- Stock an item
5- Add new item or update item
6- Delete item
7- Search by name
0- Exit program
> 4
```

```
Stock Item under construction!
Press <ENTER> to continue...
1- List all items
2- Search by SKU
3- Checkout an item
4- Stock an item
5- Add new item or update item
6- Delete item
7- Search by name
0- Exit program
> 5
Add/Update Item under construction!
Press <ENTER> to continue...
1- List all items
2- Search by SKU
3- Checkout an item
4- Stock an item
5- Add new item or update item
6- Delete item
7- Search by name
0- Exit program
> 6
Delete Item under construction!
Press <ENTER> to continue...
1- List all items
2- Search by SKU
3- Checkout an item
4- Stock an item
5- Add new item or update item
6- Delete item
7- Search by name
0- Exit program
> 7
Search by name under construction!
Press <ENTER> to continue...
1- List all items
2- Search by SKU
3- Checkout an item
4- Stock an item
5- Add new item or update item
6- Delete item
7- Search by name
0- Exit program
> 0
Exit the program? (Y)es/(N)o : x
Only (Y)es or (N)o are acceptable: n
1- List all items
2- Search by SKU
3- Checkout an item
4- Stock an item
5- Add new item or update item
```

```
6- Delete item
7- Search by name
0- Exit program
> 0
Exit the program? (Y)es/(N)o: y
```

MILESTONE 1 SUBMISSION

If not on matrix already, upload your **144_ms1.c** and professor's **144_ms1_tester.c** to your matrix account. Compile your code as follows:

```
> gcc -Wall -o ms1 144_ms1.c 144_ms1_tester.c <ENTER>
```

This command will compile your code and name your executable "**ms1**"

Execute ms1 and make sure everything works properly.

Finally run the following script from your account: (replace profname.proflastname with your professors Seneca userid)

```
~profname.proflastname/submit 144_ms1 <ENTER>
```

and follow the instructions.

Note

Use the same inputs (shown in red) as shown in the sample output's described previously in this document.

Please note that a successful submission does not guarantee full credit for this workshop.

If the professor is not satisfied with your implementation, your professor may ask you to resubmit. Resubmissions will attract a penalty.

MILESTONE 2: THE ITEM INPUT/OUTPUT

Copy all the functions implemented in milestone 1 into 144_ms2.c and add the following:

Define the following values (using #define)

```
LINEAR to be 1
FORM to be 0
```

Also create a global constant double variable called TAX that is initialized to 0.13.

Continue the development of your project by implementing the following Item related functions:
Item related information is kept in the following structure (do not modify this):
structure:

```
struct Item {
   double price;
   int sku;
   int isTaxed;
   int quantity;
   int minQuantity;
   char name[21];
};
```

price: price of a unit of the item
sku: Stock Keeping Unit, a 3 digit integer
isTaxed: an integer Flag, if true (non-zero), the tax is applied in price calculations. The value of Tax is kept in the global constant double TAX variable.
quantity: the quantity of the time in the inventory.
minQuantity: the minimum quantity number in inventory; any inventory quantity value less than this will cause a warning to order more of this item later in development.
name: a 20 character, C string (i.e a 21 character NULL terminated array of characters) to keep the name of the item.

Implement the following Item related functions:

```
double totalAfterTax(struct Item item);
```

> This function receives an **Item** and calculates and returns the total inventory price of the item by multiplying the **price** by the **quantity** of the item and adding TAX if applicable (if **isTaxed** is true).

```
int isLowQuantity(struct Item item);
```

> This function receives an **Item** and returns true (1) if the **Item quantity** is less than **Item minimum quantity** and false (0) otherwise.

```
struct Item itemEntry(int sku);
```

This function receives an integer argument for **sku** and creates an Item and sets its **sku** to the **sku** argument value.
Then it will prompt the user for all the values of the Item (except the **sku** that is already set) in the following order:
Name, Price, Quantity, Minimum Quantity and Is Taxed.

To get the **name** from the user, use the this format specifier in scanf: **"%20[^\n]"** and then clear the keyboard using **flushKeyboard**() function.

This format specifier tells to scanf to read up to 20 characters from the keyboard and stop if "\n" (ENTER KEY) is entered. After this flushKeyboard() gets rid of the "\n" left in the keyboard.

Use the data entry functions you created in milestone 1 to get the rest of the values. (for **isTaxed**, use the **yes**() function in milestone 1).
Here is the format of the data Entry: (Underlined *Italic* **Bold** Red values are user entries)

```
>        SKU: 999<
>       Name: Red Apples<
>      Price: 4.54<
>   Quantity: 50<
>Minimum Qty: 5<
>   Is Taxed: n<
```

```
void displayItem(struct Item item,int linear);
```

This function receives two arguments: an **Item** and an integer flag called **linear**.
This function prints an **Item** on screen in two different formats depending on the value of "**linear**" flag being true or false.
If linear is true it will print the Item values in a line as with following format:
1- bar char "|"
2- **sku**: integer, in 3 spaces
3- bar char "|"
4- **name**: left justified string in 20 characters space
5- bar char "|"
6- **price**: double with 2 digits after the decimal point in 8 spaces
7- bar char and two spaces "| "
8- **IsTaxed**: Yes or No in 3 spaces
9- bar char and one space "| "
10- **quantity**: integer in 3 spaces
11- space, bar char and space" | "
12- **minQuantity**: integer in 3 spaces
13- space and bar char " |"
14- **Total price**: double with 2 digits after the decimal point in 12 spaces
15- bar char "|"
16- if the quantity is low then three asterisks ("***") or nothing otherwise.

Example:

```
>|999|Red Apples          |    4.54|   No|  50 |   5 |      227.00|<
```

If low value and Taxed:

```
>|999|Red Apples          |    4.54|  Yes|   2 |   5 |       10.26|***<
```

If linear is false (or in FORM format) then the values are printed as follows:

```
>        SKU: 999<
>       Name: Red Apples<
>      Price: 4.54<
>   Quantity: 50<
>Minimum Qty: 5<
>   Is Taxed: No<
```

Two digits after the decimal point

If low value and Taxed:

```
>        SKU: 999<
>       Name: Red Apples<
>      Price: 4.54<
>   Quantity: 2<
>Minimum Qty: 5<
>   Is Taxed: Yes<
>WARNING: Quantity low, please order ASAP!!!<
```

```
void listItems(const struct Item item[], int noOfItems);
```

This function receives a constant array of **Items** and their number and prints the items in list with the grand total price at the end.
Create an integer for the loop counter and a double grand total variable that is initialized to zero.
First print the Titles of the list using printTitle() function.
Then it will loop through the **items** up to noOfItems.
In each loop:

Print the row number (loop counter plus one), left justified in four spaces and then display the item in LINEAR format. Then add the total price of the current Item element in the array to the grand total value.

After loop is done print the footer by passing the grand total to it. (use printFooter() function).

```
int locateItem(const struct Item item[], int NoOfRecs, int sku, int* index);
```

This function receives a constant array of Items and their number. Also an SKU to look for in the Item array. The last argument is a pointer to an index. The target of this index pointer will be set to the index of the Item-element in which the sku is found, otherwise no action will be taken on index pointer.
If an Item with the SKU number as the sku argument is found, after setting the target of the index pointer to the index of the found item, a true value (non-zero, preferably 1) will be returned, otherwise a false value (0) will be returned.

MILESTONE 2 SUBMISSION

If not on matrix already, upload your **144_ms2.c** and professor's **144_ms2_tester.c** to your matrix account. Compile your code as follows:

```
> gcc -Wall -o ms2 144_ms2.c 144_ms2_tester.c <ENTER>
```

This command will compile your code and name your executable "**ms2**"

Execute ms2 and make sure everything works properly.

Finaly run the following script from your account: (replace profname.proflastname with your professors Seneca userid)

```
~profname.proflastname/submit 144_ms2 <ENTER>
```

and follow the instructions.

NOTE

When prompted for user input **use the data provided on Page 12** (in **RED**) in the description for the function itemEntry

Please note that a successful submission does not guarantee full credit for this workshop.

If the professor is not satisfied with your implementation, your professor may ask you to resubmit. Resubmissions will attract a penalty.