This programming project is due on **Thursday, July 31, 2025**.

Reminder: Do your own work on this project. Do not obtain any code from another student, or from the Internet. Do not show your code to anyone except the instructor, or an official BHCC Tutor. Refer also to the last page of the course *Syllabus*, for details about the BHCC policy regarding academic dishonesty.

Be sure that you read and understand this entire document before you begin writing your code. Pay close attention to the **Project Deliverables** and **Grading Criteria** sections of this document. If you have **questions**, ask the instructor during class or contact the instructor by BHCC e-mail: pmorgan@bhcc.edu.

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Inventory Application Program

This project involves designing and creating a C++ program that will utilize the **InventoryItem** class, which is described in Section 13.10 (pages 803-807) and Section 13.12 (pages 809-812) of the Gaddis textbook. (The **`InventoryItem.h`** source code for this class is provided on *Moodle*.) Your program must not modify the class specification for the **InventoryItem** class.

The program **must** be organized as a "Command Loop" program. (Refer to the **Ch06_sample_code_CommandLoop...** resource in the **Sample Code** section of *Moodle*.)

The program **must** implement the following interactive commands:

a	**A**dd parts: increase the **units** value for an *existing* **InventoryItem** object.
h	print **H**elp text.
i	**I**nput inventory data from a file.
n	create a **N**ew inventory Item.
o	**O**utput inventory data to a file.
p	**P**rint inventory list on the screen.
q	**Q**uit (end the program).
r	**R**emove parts: reduce the **units** value for an *existing* **InventoryItem** object.

(Refer to the **Requirements for Interactive Commands** section of this document for more details.)

The program must create an array of 100 **InventoryItem** objects (or a *vector* of **InventoryItem** objects).

You are **NOT** allowed to use the **stringstream** class for any part of this assignment. If you submit a solution for this assignment that uses the **stringstream** class, the **basic_stringstream** class or ***any*** class associated with the **<sstream>** library, then your grade for the assignment will be ZERO.

Requirements for Interactive Commands

Each one of these commands **must** be implemented as a separate function: the main function must accept the command input from the user and call the appropriate function.

Command	Requirement
a	**Add Parts:** 1. Output a prompt, asking the user to specify the desired *item number*. • If the user specifies an *item number* that is not in use (no item present in the data), output an error message. 2. Output a prompt, asking the user to specify *how many* units to add. • If the input specified by the user is negative, or if the input specified by the user *would* modify the quantity to a value that it is larger than the stated maximum (30 units), output an error message. 3. If there were no errors, modify the **InventoryItem** object as requested.
h	**Print Help Text:** Output a brief summary of the user commands.
i	**Input Inventory Data from File:** 1. Output a prompt, asking the user to specify the name of the input file. 2. Read the data from the file into the **InventoryItem** array (or vector). Refer to the **Data File Format** section of this document. (You **must** use the **splitLineToArray** function that we discussed in class and is available on *Moodle*: the **splitLineToArray** function is part of the sample program in the **Ch10_sample_code_SplitLineToArray_demo…** resource in the **Sample Code** section of *Moodle*.)
n	**Create a New Inventory Item:** 1. Input (from the keyboard) values for the description, unit cost and initial quantity (units) for a new **InventoryItem**. 2. Be sure to use suitable prompts, so the user knows what input is expected.
o	**Output Inventory Data to File:** 1. Output a prompt, asking the user to specify the name of the output file. 2. Write the data from the **InventoryItem** array (or vector) to the output file, following the **required** file format.
p	**Print Inventory Data to Screen:** Output the contents of the **InventoryItem** array (or vector) to the screen. (Refer to the **Sample Output** section of this document for formatting examples.)
q	**Quit (exit) the Program**

Command	Requirement
r	**Remove Parts from Existing Inventory Item:** 1. Output a prompt, asking the user to specify the desired *item number*. • If the user specifies an *item number* that is not in use (no item present in the data), output an error message. 2. Output a prompt, asking the user to specify *how many* units to remove. 3. If the input specified by the user is *negative*, or if the input specified by the user is *greater than* the **units** variable of the **InventoryItem** object, output an error message. 4. If there were no errors, modify the **InventoryItem** object as requested.

Data File Format

The "input" / "output" commands read / write data that is in a "pipe-delimited" text file.
The format of each line of text, in the data file, is described below:

File Format
inventory item number | *description* | *cost* | *units*

Explanation of Data Fields	
Field name	**Explanation**
inventory item number	For the *output* file, this number is the same as the array (or vector) index. For the *input* file, the contents of this field must be read from the data file, but then **thrown away**. That is, this value is effectively **ignored**, because the input data will be appended to the end of the "populated" portion of the **InventoryItem** array (or vector).
description	Description of the inventory item
cost	Cost per unit for the inventory item
units	Number of units present for the inventory item (must be greater than or equal to zero and less than or equal to 30).

When reading the data file, your program needs to read one line of text from the file at a time, break each line of text into separate fields (by calling the **splitLineToArray** function), and convert the text from each field to the correct data type.

- Remember that the code to process the **input file** must read the first field of each line, but then throw it away. There is no class variable in the **InventoryItem** class for *inventory item number*, and your program must not modify the **InventoryItem** class specification.
- **DO NOT** create an `inventoryItemNumber` member variable in the **InventoryItem** class.
- Copy the **splitLineToArray** function that we discussed in class and is available on *Moodle*. The **Sample Code** section of *Moodle* includes the **Ch10_sample_code_SplitLineToArray_demo**…. resource. The **splitLineToArray** function is part of that sample program. (**DO NOT** blindly copy the entire program.) Use the **splitLineToArray** function without modification. **DO NOT** write your own function for this purpose.

Important Design Requirements

- When processing an **input** data file, be sure to remember that the first field of each line of data in the input file must be "skipped over" (that is, effectively ignored).
- The **output** file format must be the same as the **input** file format. That is, any file that your program creates with the "**o**" command must be readable by the "**i**" command of your program.
- The **units** member variable of any **InventoryItem** object must *never* be negative and also must *never* be greater than the value of 30.
- You are **NOT** allowed to use the **stringstream** class for any part of this assignment. If you submit a solution for this assignment that uses the **stringstream** class, the **basic_stringstream** class or ***any*** class associated with the **<sstream>** library, then your grade for the assignment will be ZERO.
- You are **NOT** allowed to modify the **splitLineToArray** function that is provided for you on *Moodle*. (Refer to the **Ch10_sample_code_SplitLineToArray_demo**…. resource.) If you submit a solution for this assignment that includes *any* changes to the **splitLineToArray** function, then your grade for the assignment will be ZERO.

Sample Test Data

Four sample input files are provided: **electrical.txt**, **fasteners.txt**, **miscellaneous.txt** and **plumbing.txt**. The data files that your program creates must obey the same file format as these sample files. The program must work correctly with these files, as well as general files of similar format.

electrical.txt

```
0|Cable|5.00|18
1|Extension Cord (14/3, 25 ft)|27.95|6
2|Light switch (15 amp)|2.79|10
3|Ceiling Fan (52 inch)|79.95|3
4|Vinyl Electrical Tape (20 ft roll)|0.79|30
5|GFI Tester|9.35|5
```

fasteners.txt

```
0|Turnbuckle|3.80|25
1|Siding nails (box of 100)|4.00|20
2|Flat washer (box of 100)|2.80|30
3|Machine screw (box of 100)|3.20|10
4|Hex bolt (box of 100)|6.50|23
5|Hex nut (box of 100)|3.80|15
6|Sheet Metal Screw (qty 100)|1.50|28
```

miscellaneous.txt

```
0|Door Hinges (3-pack)|6.30|10
1|Rubber work boots (1 pair)|28.00|5
2|Leather Work Gloves (1 pair)|12.00|8
3|Long Handle Grass Shear|30.00|5
```

plumbing.txt

```
0|Pump|39.00|20
1|Gasket|1.50|29
2|Water Level Guage|12.99|30
3|Faucet Repair Kit|4.89|8
4|Teflon Thread Seal Tape (50 ft roll)|3.30|12
5|shutoff valve|6.50|10
```

Sample Interactive Session

In the sample data on the next several pages, text that the user types is shown in **bold**. In actuality, what the user types would have the same text format as the rest of the output.

Sample Interactive Session

```
Command: h
Supported commands:
                a               Add parts.
                h               print Help text.
                i               Input inventory data from a file.
                n               New inventory Item.
                o               Output inventory data to a file.
                p               Print inventory list.
                q               quit (end the program).
                r               Remove parts.

Command: i
Enter name of input file: plumbing.txt
6 records loaded to array.
Command: p

Item Num    Description                                    Cost    Quantity
_______     ___________                                    ____    ________
   0        Pump                                          39.00          20
   1        Gasket                                         1.50          29
   2        Water Level Guage                             12.99          30
   3        Faucet Repair Kit                              4.89           8
   4        Teflon Thread Seal Tape (50 ft roll)           3.30          12
   5        shutoff valve                                  6.50          10
6 records.
Command: i
Enter name of input file: electrical.txt
6 records loaded to array.
```

Sample Interactive Session

```
Command: p

Item Num    Description                                  Cost    Quantity
_______     ___________                                  ____    ________
   0        Pump                                        39.00          20
   1        Gasket                                       1.50          29
   2        Water Level Guage                           12.99          30
   3        Faucet Repair Kit                            4.89           8
   4        Teflon Thread Seal Tape (50 ft roll)         3.30          12
   5        shutoff valve                                6.50          10
   6        Cable                                        5.00          18
   7        Extension Cord (14/3, 25 ft)                27.95           6
   8        Light switch (15 amp)                        2.79          10
   9        Ceiling Fan (52 inch)                       79.95           3
   10       Vinyl Electrical Tape (20 ft roll)           0.79          30
   11       GFI Tester                                   9.35           5
12 records.
Command: a

Choose a Item Number: 7
How many parts to add? 5
Command: p

Item Num    Description                                  Cost    Quantity
_______     ___________                                  ____    ________
   0        Pump                                        39.00          20
   1        Gasket                                       1.50          29
   2        Water Level Guage                           12.99          30
   3        Faucet Repair Kit                            4.89           8
   4        Teflon Thread Seal Tape (50 ft roll)         3.30          12
   5        shutoff valve                                6.50          10
   6        Cable                                        5.00          18
   7        Extension Cord (14/3, 25 ft)                27.95          11
   8        Light switch (15 amp)                        2.79          10
   9        Ceiling Fan (52 inch)                       79.95           3
   10       Vinyl Electrical Tape (20 ft roll)           0.79          30
   11       GFI Tester                                   9.35           5
12 records.
Command: r

Choose a Item Number: 9
How many parts to remove? 5

Error:  You are attempting to remove more parts than the Item currently holds.
Command: r

Choose a Item Number: 9
How many parts to remove? 3
```

Sample Interactive Session

```
Command: p

Item Num    Description                                  Cost    Quantity
_______     ___________                                  ____    ________
   0        Pump                                        39.00          20
   1        Gasket                                       1.50          29
   2        Water Level Guage                           12.99          30
   3        Faucet Repair Kit                            4.89           8
   4        Teflon Thread Seal Tape (50 ft roll)         3.30          12
   5        shutoff valve                                6.50          10
   6        Cable                                        5.00          18
   7        Extension Cord (14/3, 25 ft)                27.95          11
   8        Light switch (15 amp)                        2.79          10
   9        Ceiling Fan (52 inch)                       79.95           0
   10       Vinyl Electrical Tape (20 ft roll)           0.79          30
   11       GFI Tester                                   9.35           5
12 records.

Command: o
Enter name of output file: testData01.txt
12 records written to file.
Command: i
Enter name of input file: testData01.txt
12 records loaded to array.
Command: p

Item Num    Description                                  Cost    Quantity
_______     ___________                                  ____    ________
   0        Pump                                        39.00          20
   1        Gasket                                       1.50          29
   2        Water Level Guage                           12.99          30
   3        Faucet Repair Kit                            4.89           8
   4        Teflon Thread Seal Tape (50 ft roll)         3.30          12
   5        shutoff valve                                6.50          10
   6        Cable                                        5.00          18
   7        Extension Cord (14/3, 25 ft)                27.95          11
   8        Light switch (15 amp)                        2.79          10
   9        Ceiling Fan (52 inch)                       79.95           0
   10       Vinyl Electrical Tape (20 ft roll)           0.79          30
   11       GFI Tester                                   9.35           5
   12       Pump                                        39.00          20
   13       Gasket                                       1.50          29
   14       Water Level Guage                           12.99          30
   15       Faucet Repair Kit                            4.89           8
   16       Teflon Thread Seal Tape (50 ft roll)         3.30          12
   17       shutoff valve                                6.50          10
   18       Cable                                        5.00          18
   19       Extension Cord (14/3, 25 ft)                27.95          11
   20       Light switch (15 amp)                        2.79          10
   21       Ceiling Fan (52 inch)                       79.95           0
```

Sample Interactive Session

```
   22       Vinyl Electrical Tape (20 ft roll)          0.79          30
   23       GFI Tester                                  9.35           5
24 records.
Command: n
Enter description for new Item: Broom
Enter unit cost for new Item: 9.99
Enter initial quantity for the new Item: 12
Announcing a new inventory Item: Broom
We now have 25 different inventory Items in stock!
Command: p

Item Num    Description                                  Cost    Quantity
_______     ___________                                  ____    ________
   0        Pump                                        39.00          20
   1        Gasket                                       1.50          29
   2        Water Level Guage                           12.99          30
   3        Faucet Repair Kit                            4.89           8
   4        Teflon Thread Seal Tape (50 ft roll)         3.30          12
   5        shutoff valve                                6.50          10
   6        Cable                                        5.00          18
   7        Extension Cord (14/3, 25 ft)                27.95          11
   8        Light switch (15 amp)                        2.79          10
   9        Ceiling Fan (52 inch)                       79.95           0
   10       Vinyl Electrical Tape (20 ft roll)           0.79          30
   11       GFI Tester                                   9.35           5
   12       Pump                                        39.00          20
   13       Gasket                                       1.50          29
   14       Water Level Guage                           12.99          30
   15       Faucet Repair Kit                            4.89           8
   16       Teflon Thread Seal Tape (50 ft roll)         3.30          12
   17       shutoff valve                                6.50          10
   18       Cable                                        5.00          18
   19       Extension Cord (14/3, 25 ft)                27.95          11
   20       Light switch (15 amp)                        2.79          10
   21       Ceiling Fan (52 inch)                       79.95           0
   22       Vinyl Electrical Tape (20 ft roll)           0.79          30
   23       GFI Tester                                   9.35           5
   24       Broom                                        9.99          12
25 records.
Command: n
Enter description for new Item: Dust Pan
Enter unit cost for new Item: 5.99
Enter initial quantity for the new Item: 5
Announcing a new inventory Item: Dust Pan
We now have 26 different inventory Items in stock!
Command: p

Item Num    Description                                  Cost    Quantity
_______     ___________                                  ____    ________
```

Sample Interactive Session

```
   0        Pump                                    39.00          20
   1        Gasket                                   1.50          29
   2        Water Level Guage                       12.99          30
   3        Faucet Repair Kit                        4.89           8
   4        Teflon Thread Seal Tape (50 ft roll)     3.30          12
   5        shutoff valve                            6.50          10
   6        Cable                                    5.00          18
   7        Extension Cord (14/3, 25 ft)            27.95          11
   8        Light switch (15 amp)                    2.79          10
   9        Ceiling Fan (52 inch)                   79.95           0
   10       Vinyl Electrical Tape (20 ft roll)       0.79          30
   11       GFI Tester                               9.35           5
   12       Pump                                    39.00          20
   13       Gasket                                   1.50          29
   14       Water Level Guage                       12.99          30
   15       Faucet Repair Kit                        4.89           8
   16       Teflon Thread Seal Tape (50 ft roll)     3.30          12
   17       shutoff valve                            6.50          10
   18       Cable                                    5.00          18
   19       Extension Cord (14/3, 25 ft)            27.95          11
   20       Light switch (15 amp)                    2.79          10
   21       Ceiling Fan (52 inch)                   79.95           0
   22       Vinyl Electrical Tape (20 ft roll)       0.79          30
   23       GFI Tester                               9.35           5
   24       Broom                                    9.99          12
   25       Dust Pan                                 5.99           5
26 records.
Command: o
Enter name of output file: testData02.txt
26 records written to file.
Command: n
Enter description for new Item: Gasoline Can
Enter unit cost for new Item: 8.99
Enter initial quantity for the new Item: 34
ERROR: initial quantity must be >= zero and <= 30.
Enter initial quantity for the new Item: 29
Announcing a new inventory Item: Gasoline Can
We now have 27 different inventory Items in stock!
Command: p

Item Num    Description                              Cost    Quantity
_______     ___________                              ____    ________
   0        Pump                                    39.00          20
   1        Gasket                                   1.50          29
   2        Water Level Guage                       12.99          30
   3        Faucet Repair Kit                        4.89           8
   4        Teflon Thread Seal Tape (50 ft roll)     3.30          12
   5        shutoff valve                            6.50          10
   6        Cable                                    5.00          18
   7        Extension Cord (14/3, 25 ft)            27.95          11
```

Sample Interactive Session

```
   8        Light switch (15 amp)                          2.79          10
   9        Ceiling Fan (52 inch)                         79.95           0
   10       Vinyl Electrical Tape (20 ft roll)             0.79          30
   11       GFI Tester                                     9.35           5
   12       Pump                                          39.00          20
   13       Gasket                                         1.50          29
   14       Water Level Guage                             12.99          30
   15       Faucet Repair Kit                              4.89           8
   16       Teflon Thread Seal Tape (50 ft roll)           3.30          12
   17       shutoff valve                                  6.50          10
   18       Cable                                          5.00          18
   19       Extension Cord (14/3, 25 ft)                  27.95          11
   20       Light switch (15 amp)                          2.79          10
   21       Ceiling Fan (52 inch)                         79.95           0
   22       Vinyl Electrical Tape (20 ft roll)             0.79          30
   23       GFI Tester                                     9.35           5
   24       Broom                                          9.99          12
   25       Dust Pan                                       5.99           5
   26       Gasoline Can                                   8.99          29
27 records.
Command: i
Enter name of input file: fasteners.txt
7 records loaded to array.
Command: i
Enter name of input file: miscellaneous.txt
4 records loaded to array.
Command: p

Item Num    Description                                    Cost    Quantity
________    ___________                                    ____    ________
   0        Pump                                          39.00          20
   1        Gasket                                         1.50          29
   2        Water Level Guage                             12.99          30
   3        Faucet Repair Kit                              4.89           8
   4        Teflon Thread Seal Tape (50 ft roll)           3.30          12
   5        shutoff valve                                  6.50          10
   6        Cable                                          5.00          18
   7        Extension Cord (14/3, 25 ft)                  27.95          11
   8        Light switch (15 amp)                          2.79          10
   9        Ceiling Fan (52 inch)                         79.95           0
   10       Vinyl Electrical Tape (20 ft roll)             0.79          30
   11       GFI Tester                                     9.35           5
   12       Pump                                          39.00          20
   13       Gasket                                         1.50          29
   14       Water Level Guage                             12.99          30
   15       Faucet Repair Kit                              4.89           8
   16       Teflon Thread Seal Tape (50 ft roll)           3.30          12
   17       shutoff valve                                  6.50          10
   18       Cable                                          5.00          18
   19       Extension Cord (14/3, 25 ft)                  27.95          11
   20       Light switch (15 amp)                          2.79          10
```

Sample Interactive Session

```
   21       Ceiling Fan (52 inch)                    79.95          0
   22       Vinyl Electrical Tape (20 ft roll)        0.79         30
   23       GFI Tester                                9.35          5
   24       Broom                                     9.99         12
   25       Dust Pan                                  5.99          5
   26       Gasoline Can                              8.99         29
   27       Turnbuckle                                3.80         25
   28       Siding nails (box of 100)                 4.00         20
   29       Flat washer (box of 100)                  2.80         30
   30       Machine screw (box of 100)                3.20         10
   31       Hex bolt (box of 100)                     6.50         23
   32       Hex nut (box of 100)                      3.80         15
   33       Sheet Metal Screw (qty 100)               1.50         28
   34       Door Hinges (3-pack)                      6.30         10
   35       Rubber work boots (1 pair)               28.00          5
   36       Leather Work Gloves (1 pair)             12.00          8
   37       Long Handle Grass Shear                  30.00          5
38 records.

Command: o
Enter name of output file: testData03.txt
38 records written to file.
Command: q
Exit.
```

Project Deliverables:

The project source file(s) must be submitted to *Moodle*, using the *Moodle* Activity:

CSC237_Project2

Submit your **`.cpp`** file(s) and any **`.h`** file(s) that you create. I will need to compile your code on my home computer in order to grade it. If you are submitting more than one file (**`.cpp`** and/or **`.h`**), do **not** enclose the files in a ZIP file. *Moodle* will allow you to submit multiple source files.

For example:

Do ***not*** submit the entire *Visual Studio* project.

Do ***not*** include the project folders, or any binary files.

Grading Criteria

The project will be graded according to the following grading criteria:

Feature	Portion of grade
1. The program functions correctly.	60%

2. In the **main** function of the program, there is a loop that contains code to support the following input commands:
 	
`a Add parts.`
`h print Help text.`
`i Input inventory data from a file.`
`n New inventory Item.`
`o Output inventory data to a file.`
`p Print inventory list.`
`q quit (end the program).`
`r Remove parts.`
 	
The code for *each* command is a **call to a function** that does the actual work of that command.
	3%

3. The "command loop" in the **main** function must continue until the user enters a '**q**' command.	2%
4. Each command must call a separate function. That is, the "**main**" function must not be excessively long. Do **NOT** put an excessive amount of code in the **main** function or any other function. The **main** function must be primarily a loop that inputs each user command and *calls other functions* to implement those commands.	10%
5. The program is clearly organized and **commented** so that it is easy to read and understand. At a minimum, there must be a comment at the beginning of each function that explains what that function does. Use your judgement regarding any additional comments that may be needed to make the program easy to understand, without over-commenting the program. (As you get more experience, your judgement about this will improve.)	10%
6. Use good variable names and function names: • A variable name or function name must indicate something about what that variable or function does in the program. • Variable names and function names must be not too short and not too long.	5%
7. Place a brief summary of the program in comments at the beginning of each source file that you create. Also be sure these comments have your name and the due-date for the project.	5%
8. Cleanup any unused portions of code, such as "failed attempts" that you later replaced.	3%
9. Cleanup any irrelevant comments	2%
Total:	100%

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