

**Putting the basics together:****Tracking Value of a Stock**

It's finally time to write a complete program. This project will use many of the C++ features that were illustrated in the source code you were given for the first and second programming assignments. The resulting program will read simple data for a single stock and produce a report. This will require reading a data from an input file, doing simple calculations, and writing a simple output file. In addition, your program will have to use a C++ selection mechanism to make decisions regarding several possible charges.

**Sample input data:**

Here is a sample input file, named `StockData.txt`, for the program. The first line specifies the name of the customer, and the second specifies the customer's account number. The third line specifies the report date. The remaining lines specify the name of the stock, number of shares the customer holds, and the initial and final prices for the stock.

Each data value is preceded by a descriptive label that ends with a vertical bar character '| '.

Customer Name	John Q Public
Account #	432-10023-4311-89
Report Date	08/05/2002
Stock Name	MSFT
Shares held	650
Opening Price	57.32
High Price	58.14
Low Price	55.03
Closing Price	55.17

The input values are guaranteed to be syntactically and logically correct. The customer name, account number and date are just string data. For formatting purposes, you may assume that the customer name will be no more than 40 characters long, and the account number and date will be no longer than the ones shown above.

**Calculations:**

For the given stock, you will calculate the change in total value of all the shares the customer holds, and the percentage change in the value of a single share of the stock.

The percentage change is the change in value as a percentage of the opening stock price.

For our purposes, the change in total value and percentage change will always be reported as nonnegative values.

There is one important data representation issue in this project. As you will soon learn, computer hardware almost never stores decimal values exactly, and so any calculations done with decimal values are likely to be slightly wrong. To avoid that, your program is required to store all monetary amounts internally using integer variables. You may either store dollars and cents separately, or store a total amount in cents. Failure to do this will result in a deduction when the TAs evaluate your implementation, and also may result in a deduction when the Curator scores your submission.

**Sample output:**

Here is a sample output file, named `Summary.txt`, which corresponds to the input data given above:

Programmer:	William D McQuain			
	CS 1044 Simple Stock Tracker			
Customer:	John Q Public	432-10023-4311-89		
Date:	08/05/2002			
Stock	Open	Close	Loss	% Change
MSFT	57.32	55.17	1397.50	0.038

The first two lines just identify the programmer and project. Next there is a blank line. The next line specifies the customer name and account number, and the next specifies the report date. The next line gives the headers for the stock report. There is one small issue here. You must print the label "Gain" if the stock price increased and "Loss" if it decreased.

The final line gives the stock name, initial and final prices, total gain or loss, and the percentage change.

All monetary amounts are to be reported to two decimal places; the percentage change is to be reported to three decimal places, as shown above.

If you have read the description of how the Curator scores your program in the *Student Guide*, you know that is important that you use the same spelling and capitalization for all the labels shown above. The horizontal spacing does not effect scoring unless you combine things that should be separate or separate things that should be combined. You are free to experiment with the horizontal layout but you should try to align the columns neatly.

### **Suggested implementation plan:**

You should design your solution piece by piece. Begin by identifying the major tasks that have to be done, and then add detail for each of those tasks. Your implementation should be developed in the same manner. Here's a suggested order of implementation.

First, implement the input code to read the customer name, account number and date, and write the output code to print them back out in the specified format. This will require declaring the appropriate stream variables and setting up the file streams, and declaring and using variables to store the input values. Test this code and make sure it produces correct results. Once you know this part works you should never have to worry about it again.

Second, implement the input code to read the stock name and other stock data. Add code to just echo the values you read in, to be sure you're reading them correctly. Note that two pieces of given information are not used in any calculations.

Then add the code to calculate the unit and total change in the stock value and to print them. Test this code. Add the calculation of the percentage change in the total value. Finally, test all of this code now to be sure it works.

By implementing the program feature by feature you let yourself concentrate on solving one small part of the problem at a time. You also should only have to test one part of it at a time as well.

### **Evaluation:**

Everything that you have been told about testing in class applies here. Do not waste submissions to the Curator in testing your program! There is no point in submitting your program until you have verified that it produces correct results on the sample data files that are provided. If you waste all of your submissions because you have not tested your program adequately then you will receive a low score on this assignment. You will not be given extra submissions.

Your submitted program will be assigned a score, out of 100, based upon the runtime testing performed by the Curator System. We will also be evaluating your submission of this program for documentation style and a few good coding practices. This will result in a deduction (ideally zero) that will be applied to your score from the Curator to yield your final score for this project.

Read the *Programming Standards* page on the CS 1044 website for general guidelines. You should comment your code in the same manner as the code given for the first two programming assignments. In particular:

- You should have a header comment identifying yourself, and describing what the program does.
- Every constant and variable you declare should have a comment explaining its logical significance in the program.
- Every major block of code should have a comment describing its purpose.
- Adopt a consistent indentation style and stick to it.

Your implementation must also meet the following requirements:

- Choose descriptive identifiers when you declare a variable or constant. Avoid choosing identifiers that are entirely lower-case.
- Use named constants instead of literal constants when the constant has logical significance.
- Use C++ streams for input and output, not C-style constructs.
- Use C++ string variables to hold character data, not C-style character pointers or arrays.
- Note: you are explicitly forbidden to write any user-defined functions for this program. This will make the program somewhat repetitive, and physically longer than the alternative. To some extent, that's the reason for this restriction.

Understand that the list of requirements here is not a complete repetition of the *Programming Standards* page on the course website. It is possible that requirements listed there will be applied, even if they are not listed here.

### Submitting your program:

You will submit this assignment to the Curator System (read the *Student Guide*), and it will be graded automatically. Instructions for submitting, and a description of how the grading is done, are contained in the *Student Guide*.

You will be allowed up to five submissions for this assignment. Use them wisely. Test your program thoroughly before submitting it. Make sure that your program produces correct results for every sample input file posted on the course website. If you do not get a perfect score, analyze the problem carefully and test your fix with the input file returned as part of the Curator e-mail message, before submitting again. The highest score you achieve will be counted.

The *Student Guide* and submission link can be found at: <http://www.cs.vt.edu/curator/>

### Pledge:

Each of your program submissions must be pledged to conform to the Honor Code requirements for this course. Specifically, you **must** include the following pledge statement in the header comment for your program:

```
// On my honor :
//
// - I have not discussed the C++ language code in my program with
//   anyone other than my instructor or the teaching assistants
//   assigned to this course.
//
// - I have not used C++ language code obtained from another student,
//   or any other unauthorized source, either modified or unmodified.
//
// - If any C++ language code or documentation used in my program
//   was obtained from another source, such as a text book or course
//   notes, that has been clearly noted with a proper citation in
//   the comments of my program.
//
// - I have not designed this program in such a way as to defeat or
//   interfere with the normal operation of the Curator System.
//
// <Student Name>
```

**Failure to include this pledge in a submission is a violation of the Honor Code.**