San José State University
Department of Computer Engineering

CMPE 180A
Data Structures and Algorithms in C++
Fall 2020
Instructor: Ron Mak

Assignment #6

Assigned: Tuesday, September 29
Due: Tuesday, October 6 at 5:30 PM
CodeCheck: http://codecheck.it/files/17093021036ojjx46vmor05k6wbx2y3qnn
Canvas: Assignment 6: Book Catalog
Points: 100

Book Catalog
This assignment will give you practice manipulating a vector of objects and reading a text file of comma-separated values (CSV). CSV files are typically written from spreadsheets.

Implement a C++ class **Book**. Create separate **.h** and **.cpp** files for the class. Implement a book catalog as a vector of book objects.

Commands
Your program will read a text file containing commands, one per line. These commands create and manipulate the book catalog. There are three types of commands:

$$+ \; isbn \textbf{,} last \textbf{,} first \textbf{,} title, category$$

Create a new book object with the ISBN *isbn*, author's last name *last*, author's first name *first*, book title *title*, and book category *category*. The fields after the **+** command are separated by commas. Valid book categories include **fiction**, **history**, and **technical**. Insert the new record into the catalog at the appropriate location to maintain the <u>sorted order by ISBN</u>. It is an error if the book is already in the catalog. Do not insert a book with a duplicate ISBN.

$$- \; isbn$$

Remove the book from the catalog that has *isbn*. It is an error if the book is not in the catalog.

?

Print <u>all</u> the books in the catalog, sorted by ISBN.

> **? isbn=***isbn*
> **? author=***last*
> **? category=***category*

Print a list of all the books in the catalog, sorted by ISBN, that match the indicated attribute. It is <u>not</u> an error if there are no matches – just print an empty list.

You must use a <u>binary search</u> to find a book with a given ISBN. Use a <u>linear search</u> to find books with given authors and categories.

Any command other than **+**, **-**, or **?** is an error.

Input file `commands.in`
Your program must read and execute these commands:

```
+ 978-0130460417,Mak,Ronald,Java Number Cruncher,technical
+ 978-1501163401,King,Stephen,Sleeping Beauties,fiction
+ 978-0470383285,Horstmann,Cay,Big C++,technical
+ 978-0470177075,Mak,Ronald,Writing Compilers,technical
+ 978-0471744870,Horstmann,Cay,Object-Oriented Design,technical
+ 978-1439156810,King,Stephen,On Writing - A Memoir of the Craft,history
?
? author=Mak
? category=technical
? category=fiction
? isbn=978-0470383285
+ 978-0470177075,Mak,Ronald,Writing Compilers,technical
? category=history
? author=King
? isbn=978-0470385285
? author=Horstmann
- 978-0130460417
$ 978-1439156810
- 978-0471744870
- 978-1439156811
?
```

You may assume there are no syntax errors in the input fields, other than possibly invalid commands. This input file has already been uploaded to CodeCheck.

See: <u>http://www.cs.sjsu.edu/~mak/CMPE180A/assignments/6/commands.in</u>

Reading comma-separated values
Your program must <u>overload the input stream extraction operator</u> **>>** to read the book information of a **+** command.

TIP: See http://www.cplusplus.com/reference/string/string/getline/

Vector insertion and deletion
Inserting a new element into a vector at a given position and removing an element at a given position from a vector are operations that require iterators. If **v** is a vector variable, **v.begin()** will return an iterator that points to the first element. Then **v.insert(v.begin + i, book)** will insert a **Book** object into position **i**, and **v.erase(v.begin + i)** will remove the **Book** object at position **i**. See http://www.cplusplus.com/reference/vector/vector/

Output book format
Your program must <u>overload the output stream insertion operator</u> **<<** to write a book's information in the format

   Book{ISBN=*isbn***, last=***last***, first=***first***, title=***title***, category=***category***}**

For example:

```
Book{ISBN=978-1501163401, last=King, first=Stephen, title=Sleeping Beauties, category=fiction}
```

Expected output

CodeCheck will match your output against:

```
+ Inserted at index 0: Book{ISBN=978-0130460417, last=Mak, first=Ronald, title=Java Number Cruncher, category=technical}

+ Inserted at index 1: Book{ISBN=978-1501163401, last=King, first=Stephen, title=Sleeping Beauties, category=fiction}

+ Inserted at index 1: Book{ISBN=978-0470383285, last=Horstmann, first=Cay, title=Big C++, category=technical}

+ Inserted at index 1: Book{ISBN=978-0470177075, last=Mak, first=Ronald, title=Writing Compilers, category=technical}

+ Inserted at index 3: Book{ISBN=978-0471744870, last=Horstmann, first=Cay, title=Object-Oriented Design, category=technical}

+ Inserted at index 4: Book{ISBN=978-1439156810, last=King, first=Stephen, title=On Writing - A Memoir of the Craft, category=history}

? All books in the catalog:
Book{ISBN=978-0130460417, last=Mak, first=Ronald, title=Java Number Cruncher, category=technical}
Book{ISBN=978-0470177075, last=Mak, first=Ronald, title=Writing Compilers, category=technical}
Book{ISBN=978-0470383285, last=Horstmann, first=Cay, title=Big C++, category=technical}
Book{ISBN=978-0471744870, last=Horstmann, first=Cay, title=Object-Oriented Design, category=technical}
Book{ISBN=978-1439156810, last=King, first=Stephen, title=On Writing - A Memoir of the Craft, category=history}
Book{ISBN=978-1501163401, last=King, first=Stephen, title=Sleeping Beauties, category=fiction}

? Books by author Mak:
Book{ISBN=978-0130460417, last=Mak, first=Ronald, title=Java Number Cruncher, category=technical}
Book{ISBN=978-0470177075, last=Mak, first=Ronald, title=Writing Compilers, category=technical}

? Books in category technical:
Book{ISBN=978-0130460417, last=Mak, first=Ronald, title=Java Number Cruncher, category=technical}
Book{ISBN=978-0470177075, last=Mak, first=Ronald, title=Writing Compilers, category=technical}
Book{ISBN=978-0470383285, last=Horstmann, first=Cay, title=Big C++, category=technical}
Book{ISBN=978-0471744870, last=Horstmann, first=Cay, title=Object-Oriented Design, category=technical}

? Books in category fiction:
Book{ISBN=978-1501163401, last=King, first=Stephen, title=Sleeping Beauties, category=fiction}

? Book with ISBN 978-0470383285:
Book{ISBN=978-0470383285, last=Horstmann, first=Cay, title=Big C++, category=technical}

+ Inserted at index 1: Book{ISBN=978-0470177075, last=Mak, first=Ronald, title=Writing Compilers, category=technical}
*** Duplicate ISDN ***

? Books in category history:
Book{ISBN=978-1439156810, last=King, first=Stephen, title=On Writing - A Memoir of the Craft, category=history}

? Books by author King:
Book{ISBN=978-1439156810, last=King, first=Stephen, title=On Writing - A Memoir of the Craft, category=history}
Book{ISBN=978-1501163401, last=King, first=Stephen, title=Sleeping Beauties, category=fiction}

? Book with ISBN 978-0470385285:

? Books by author Horstmann:
Book{ISBN=978-0470383285, last=Horstmann, first=Cay, title=Big C++, category=technical}
Book{ISBN=978-0471744870, last=Horstmann, first=Cay, title=Object-Oriented Design, category=technical}

- Removed Book{ISBN=978-0130460417, last=Mak, first=Ronald, title=Java Number Cruncher, category=technical}

$ *** Invalid command ***

- Removed Book{ISBN=978-0471744870, last=Horstmann, first=Cay, title=Object-Oriented Design, category=technical}

- Removed Book{ISBN=978-1439156811, last=, first=, title=, category=none}
*** Book not found ***

? All books in the catalog:
Book{ISBN=978-0470177075, last=Mak, first=Ronald, title=Writing Compilers, category=technical}
Book{ISBN=978-0470383285, last=Horstmann, first=Cay, title=Big C++, category=technical}
Book{ISBN=978-1439156810, last=King, first=Stephen, title=On Writing - A Memoir of the Craft, category=history}
Book{ISBN=978-1501163401, last=King, first=Stephen, title=Sleeping Beauties, category=fiction}
```

See: http://www.cs.sjsu.edu/~mak/CMPE180A/assignments/6/output.txt

Submission into Canvas

When you're satisfied with your program in CodeCheck, click the "Download" link at the very bottom of the Report screen to download a signed zip file of your solution. Submit this zip file into Canvas. You can submit as many times as you want until the deadline, and the number of submissions will not affect your score. Only your last submission will be graded.

Submit the signed zip file from CodeCheck into Canvas:
Assignment #6. Book Catalog

Note: You must submit the signed zip file that you download from CodeCheck, or your submission will not be graded. Do not rename the zip file.

Rubric

Your program will be graded according to these criteria:

Criteria	Maximum points
Good output (as determined by CodeCheck)	**20**
Good program design	**70**
• Well-designed class `Book` with public and private members.	• 10
• Binary search.	• 10
• Linear search	• 10
• Vector element insertion.	• 10
• Vector element removal.	• 10
• Overloaded input stream `>>` extraction operator.	• 10
• Overloaded output stream `<<` insertion operator.	• 10
Good program style	**10**
• Descriptive names and meaningful comments.	• 5
• Follow the coding style (formatting, braces, indentation, function declarations before the main, etc.) of the Savitch textbook.	• 5

Academic integrity

You may study together and discuss the assignments, but what you turn in must be your individual work. Assignment submissions will be checked for plagiarism using Moss (http://theory.stanford.edu/~aiken/moss/). **Copying another student's program or sharing your program is a violation of academic integrity.** Moss is not fooled by renaming variables, reformatting source code, or re-ordering functions.

Violators of academic integrity will suffer severe sanctions, including academic probation. Students who are on academic probation are not eligible for work as instructional assistants in the university or for internships at local companies.