Homework 7: Part II

**The work you do in this assignment will be used as part of project 2

Due Saturday, October 27th, 11:55 pm
+5% bonus if submitted by Thursday, October 25th 11:55 pm,
+2% bonus if submitted by Friday, October 26th 11:55 pm

This assignment is due **October 27th, at 11:55 pm**

- ***All components* (Cloud9 workspace, moodle quiz attempts, and zip file) must be completed and submitted by Saturday, October 27th, by 11:55 pm for your homework to receive points.**
- Complete submissions (Cloud9 workspace, moodle Inginious attempts, and zip file) before **Thursday, October 25th 11:55 pm** will receive a 5% bonus, and complete submissions before **Friday, October 26th 11:55 pm** will receive a 2% bonus.

Objectives:

- Practice implementing classes
- Develop proper techniques for object-oriented programming
- Manipulate arrays of objects

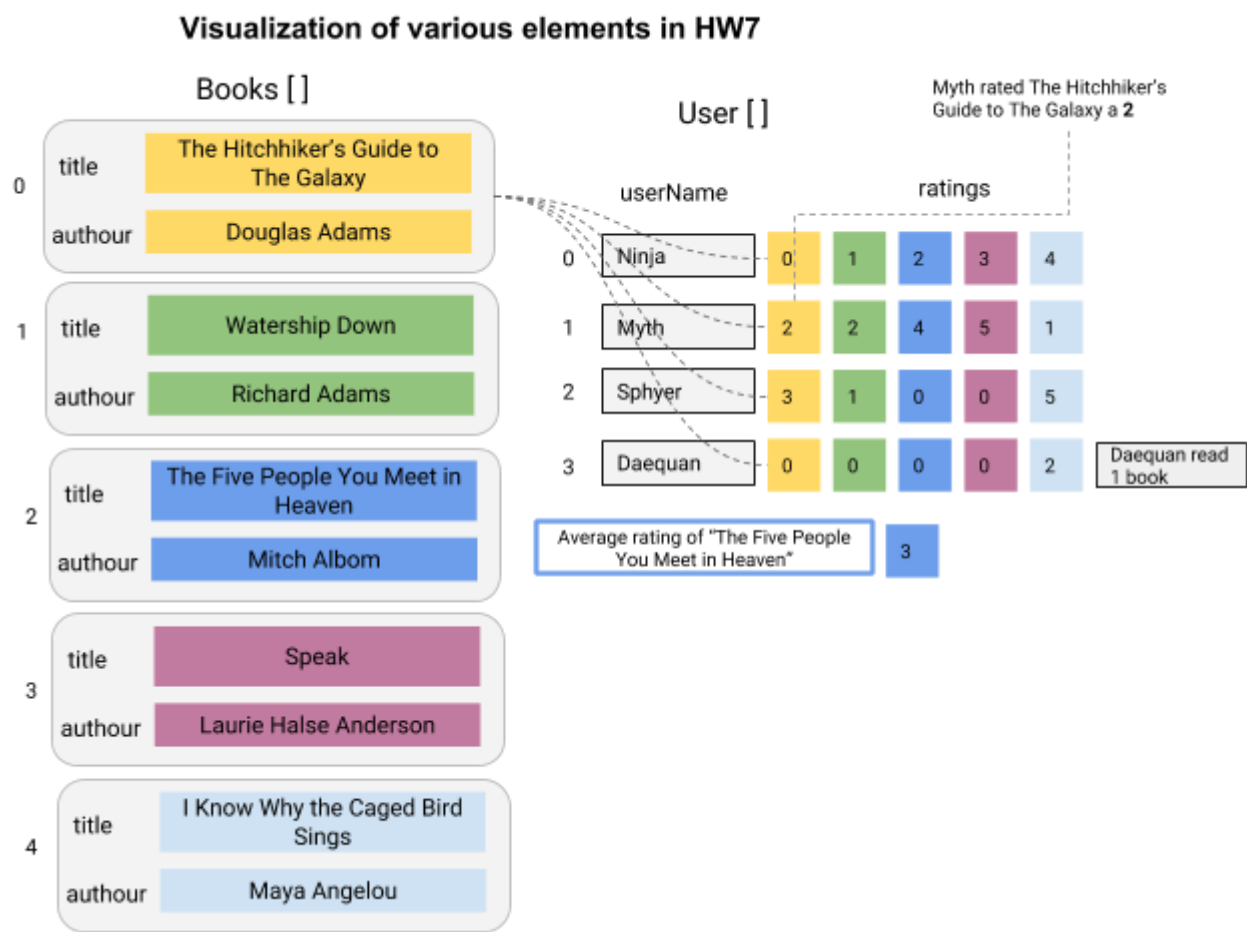
Problem Set

In part 2 you will be adapting the code you wrote in part 1 to be more object oriented. You'll realize that organizing your data in objects not only makes your code more sleek, but also makes it more dynamic. Classes are perhaps the most fundamental data structure in C++ and their use is ubiquitous in the "real world." In this assignment you will become more familiar with the relationship between classes and objects while observing some of the benefits of this data abstraction.

When creating classes, it is good programming practice to separate interface and implementation. This means defining your class in an `.h` file and implementing it in a `.cpp` file of the same name. Ultimately you will hand in five separate files, two for each class, and one driver file that will include a main function and your solutions from problems 3, 4 and 5.

Specifications

- Create two classes, Book and User. Define the two classes in header files and implement the classes in cpp files.
- In `main`() create arrays of Book and User objects, size 200 (Assume that we don't have more than 200 books and more than 200 users)
- Student should have five files (Book.h, Book.cpp, User.h, User.cpp, Hmwk7.cpp)
- The name of each member function should be exactly the as specified. If you modify the function names your solution will not pass the autograder.



Problem 1

**You should have separate files for class definition and implementation: Book.h and Book.cpp

Create a class `Book`, with separate interface and implementation, comprised of the following attributes:

Data members (private):	
string: `title`	
string: `author`	
Member functions (public):	
Default constructor	Sets both `title` and `author` to empty strings
Parameterized constructor	Takes two strings for initializing `title` and `author`, in this order
`getTitle()`	Returns `title` as a string
`setTitle(string)`	(void) Assigns `title` the value of the input string
`getAuthor()`	Returns `author` as a string
`setAuthor(string)`	(void) Assigns `author` the value of the input string

It is advisable to write your own test cases for each class. Test your class in Cloud9 before submitting to the autograder, as the autograder has a **submission limit** of **20 tries**.

Problem 2

**You should have separate files for class definition and implementation: User.h and User.cpp

Create a class `User`, with separate interface and implementation, comprised of the following attributes:

Data members (private):	
string: `username`	
int array: `ratings`	Number of elements should be `size`
int: `numRatings`	Number of books in the database

Int: `size`	The capacity of the `ratings` array (200). Constant
Member functions (public):	
Default constructor	Sets `username` to an empty string, `numRatings` to 0, `size` to 200, and all the elements of `ratings` array to the value -1
Parameterized constructor	Takes a string, an array of integers, and two integers for initializing `username`, `ratings`, `numRatings`, and `size`, respectively
`getUsername()`	Returns `username`
`setUsername(string)`	(void) Assigns `username` the value of the input string
`getRatingAt(int)`	Parameter: `int index`. Returns the rating stored at the specified index. If `index` is larger than the size of the `ratings` array, returns -1.
`setRatingAt(int,int)`	Parameters: `int index, int value`. Sets the rating to `value` at the specified `index,` if `index` is within the bounds of the array and `value` is between 0 and 5. Returns a boolean, `true` if the rating is successfully updated and `false` otherwise.
`getNumRatings()`	Returns `numRatings`
`setNumRatings(int)`	(void) Assigns `numRatings` the value of the input int
`getSize()`	Returns `size`

It is advisable to write your own test cases for each class. Test your class in Cloud9 before submitting to the autograder, as the autograder has a **submission limit** of **20 tries**.

Problem 3

Write a function `readBooks` that populates an array of `Book` objects with the title and author data found in the file `books.txt`. This function should:

- Accept four input arguments in this order:
  - string: the name of the file to be read
  - array of `Book` objects: books data

    - int: the number of Book objects currently stored in the array of Book objects
    - int: capacity of the library system *[assume a max of 200 books]*
- Use ifstream, split(), and getline to read and parse data from the file.
- For each line in the file:
    - instantiate a `Book` object,
    - fill in the `author` and `title` data members, and
    - append the object to your array of `Book` objects.
- Return the total number of books in the system, as an integer.
- If the file cannot be opened, return -1

Important: when testing your `readBooks` function, make sure it supports multiple calls in a row. For example, you should be able to call the function to read the file *books1.txt* , and then call the function again to read the file *book2.txt*. The result should be an array of Book objects, with the books from the first file, followed by the books from the second file.

Problem 4

Write a function `readRatings` that will populate an array of `User` objects with the name and rating values from the file `ratings.txt`. Each username represented in `ratings.txt` is followed by list of integers--ratings of each book in `books.txt`.

Rating	Meaning
0	Did not read
1	Hell No - hate it!!
2	Don't like it.
3	Meh - neither hot nor cold
4	Liked it!
5	Mind Blown - Loved it!

This function should:

- Accept four arguments in this order:
    - string: the name of the file to be read
    - array of `User` objects: user data
    - int: number of users currently stored in the array of User object
    - int: the capacity of the user array *[assume a max of 200 users]*
- Use ifstream, split(), and getline to read and parse data from the file.

- For each line in the file
    - instantiate a `User` object,
    - fill in the `username` data member,
    - set the `size` data member equal to the capacity parameter
    - populate the ratings array with the data in the file, and fill the rest fo the values in the array with the value -1
    - store a count for the number of ratings that are not -1 in the `numRatings` data member, and
    - append the object to your array of `User` objects.
- Print the username of each user as they are added to the system:

```
cout << user.getUsername() << "..." << endl;
```

- Return the total number of users in the system, as an integer.
- If the file cannot be opened, return -1

Important: when testing your `readRatings` function, make sure it supports multiple calls in a row. For example, you should be able to call the function to read the file *ratings1.txt* , and then call the function again to read the file *ratings2.txt*. The result should be an array of User objects, with the users from the first file, followed by the users from the second file.

Expected output:
cynthia... diane... joan... barbara... (etc.)

Problem 5

It will be useful to display the contents of your library. Next, make a function `printAllBooks` that meets the following criteria:

- Accept three arguments in this order:
    - array of `Book` objects: books data
    - int: the number of books currently stored in the arrays of Books objects
- This function does not return anything
- If the number of books is 0, print "`No books are stored`"

- Otherwise, print "`Here is a list of books`", followed by each book in the following format

  ```
  <book title > by <book author>
  ```

Driver function

Menu functionality is the same as in Homework 6. Please use the same menu function provided in Homework 6. The output of your Homework 7 should match the output from Homework 6, even if you are modifying the functions at Problems 3, 4 and 5.

For Homework 7, we will be testing only options 1, 2, 3 and 6. Options 4 and 5 are not required in this homework. However, they will be required in the following homework.

Note: the main function, menu function, and the function definitions for Problems 3, 4 and 5 should be included in Hmwk7.cpp.

At the top of the Hmwk7.cpp file, don't forget to include the header files for the two classes: Book and User

This is a menu-driven program, where the user is continually being offered six options, until they opt to quit.

1. (graded) Initialize library
   - Prompt the user for a file name.
   - Pass the file name to your `readBooks` function.
   - Print the total number of books in the database in the following format:

     ```
     Total books in the database: <numberOfBooks>
     ```

   - If no books are saved to the database due to wrong file name, then print the following message:

     ```
     No books saved to the database
     ```

2. (graded) Initialize user catalog
   - Prompt the user for a file name.
   - Pass the file name to your `readRatings` function
   - Print the total number of users in the database in the following format:

```
Total users in the database: <numberOfUsers>
```

- If no books are saved to the database due to wrong file name, then print the following message:

```
No users saved to the database
```

3. (graded) Display library contents
   - Call your `printAllBooks` function.

4. (not graded)Get number of books reviewed by a user
   - Prompt the user for a username.
   - Pass the username to your `getUserReadCount` function
   - If the user exists in the system, print the result in the following format:

```
<name> rated <numBookRead> books
```

5. (not graded)Get average rating for a title
   - Prompt the user for a title.
   - Pass the title to your `calcAvgRating` function
   - If the title exists in the database, print the result in the following format:

```
The average rating for <bookTitle> is <value>
```

`Note: <value>` is a double with 2 decimal points.

6. (graded) Quit
   - Print "`good bye!`" before exiting

IMPORTANT: How to compile multiple `.cpp` files and `.h` files

In this homework, it's required to write multiple files (.h and .cpp files) and test them before submitting them to the Inginious autograder. You need to compile and execute your code **via command line**. This means you need to type commands in a **bash** window, instead of pushing the *Run* button, like before.

Make sure you first change directory to the folder where your solution files are stored. Here, the folder is `hmwk7`. The command is `cd`, followed by the folder's name:

```
cd hmwk7/
```

When compiling in command line you need to specify all the .cpp files in your project. One example of the command for compiling the codes is:

```
g++ -std=c++11 file1.cpp file2.cpp main.cpp
```

The compiling command results in the creation of an executable file. If you did not specify a name for the executable file (like in the example above), the executable will be named `a.out`. To execute the file, use the following command:

```
./a.out
```

You can add `-o` flag to specify the name of the executable file:

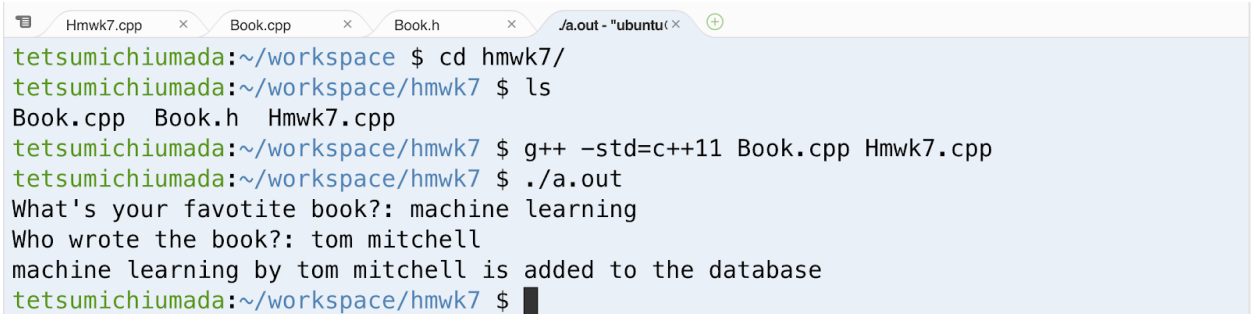
```
g++ -o myExe.out -std=c++11 file1.cpp file2.cpp main.cpp
```

To execute the file, use the following command:

```
./myExe.out
```

Example1:

Compiling `book.cpp` and `Hmwk7.cpp`. The picture below shows a **bash** window.



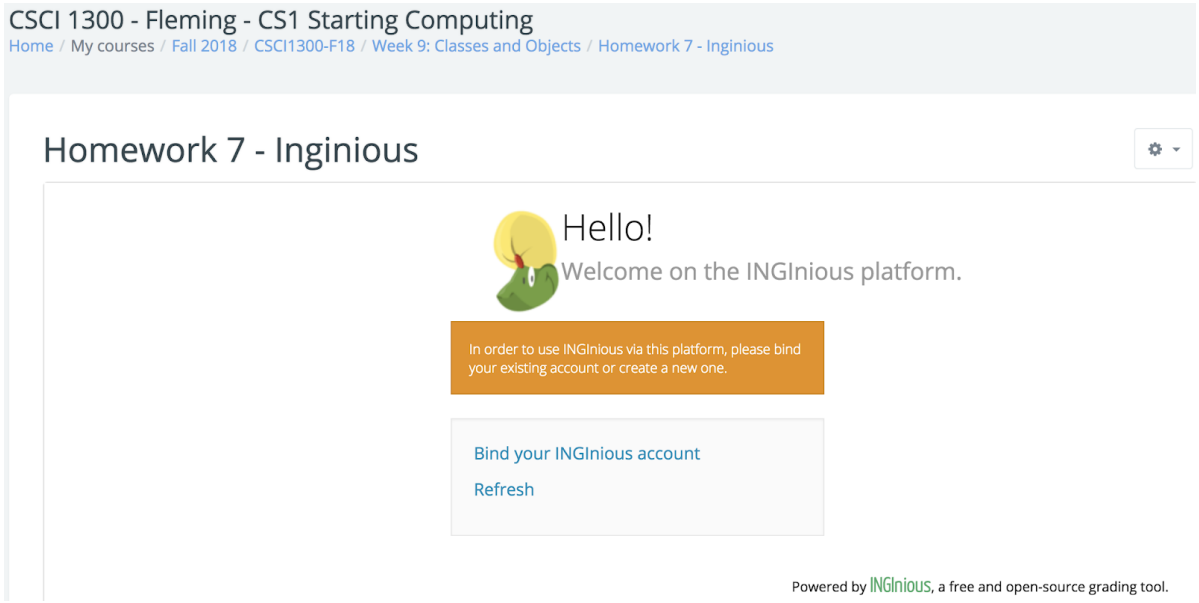
Example2: Here, the executable file is named `hmwk7`.

```
Hmwk7.cpp   Book.cpp   Book.h   ./hmwk7 - "ubun!   User.cpp   User.h
tetsumichiumada:~/workspace $ cd hmwk7/
tetsumichiumada:~/workspace/hmwk7 $ ls
Book.cpp  Book.h  Hmwk7.cpp  User.cpp  User.h
tetsumichiumada:~/workspace/hmwk7 $ g++ -std=c++11 Book.cpp User.cpp Hmwk7.cpp -o hmwk7
tetsumichiumada:~/workspace/hmwk7 $ ./hmwk7
Select a numerical option:
======Main Menu=====
1. Read book file
2. Read user file
3. Print book list
4. Find number of books user rated
5. Get average rating
6. Quit
6
good bye!
tetsumichiumada:~/workspace/hmwk7 $
```

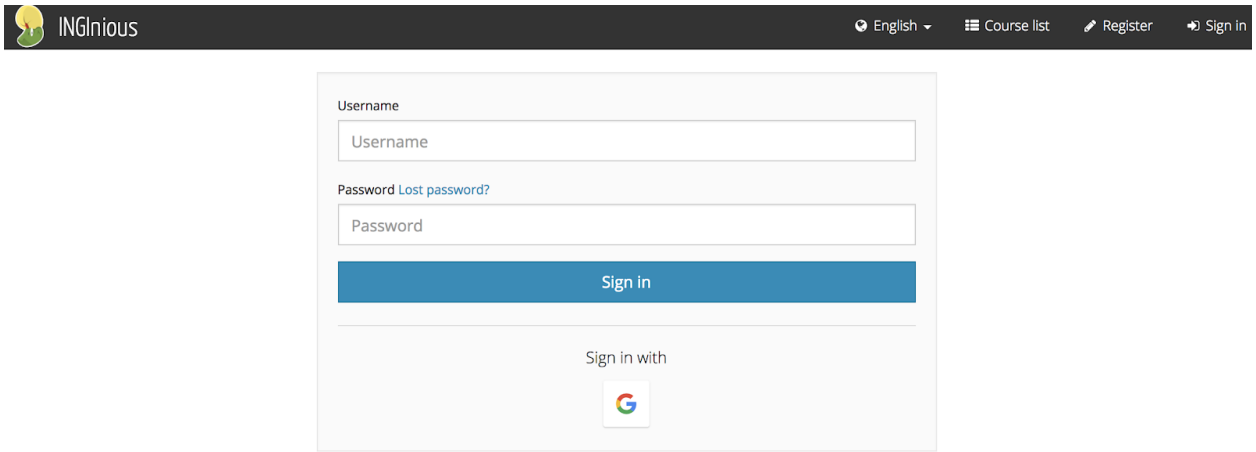
IMPORTANT: How to submit to autograder

You can find **"Homework 7 - Inginious"** link on Moodle under *Week 9*

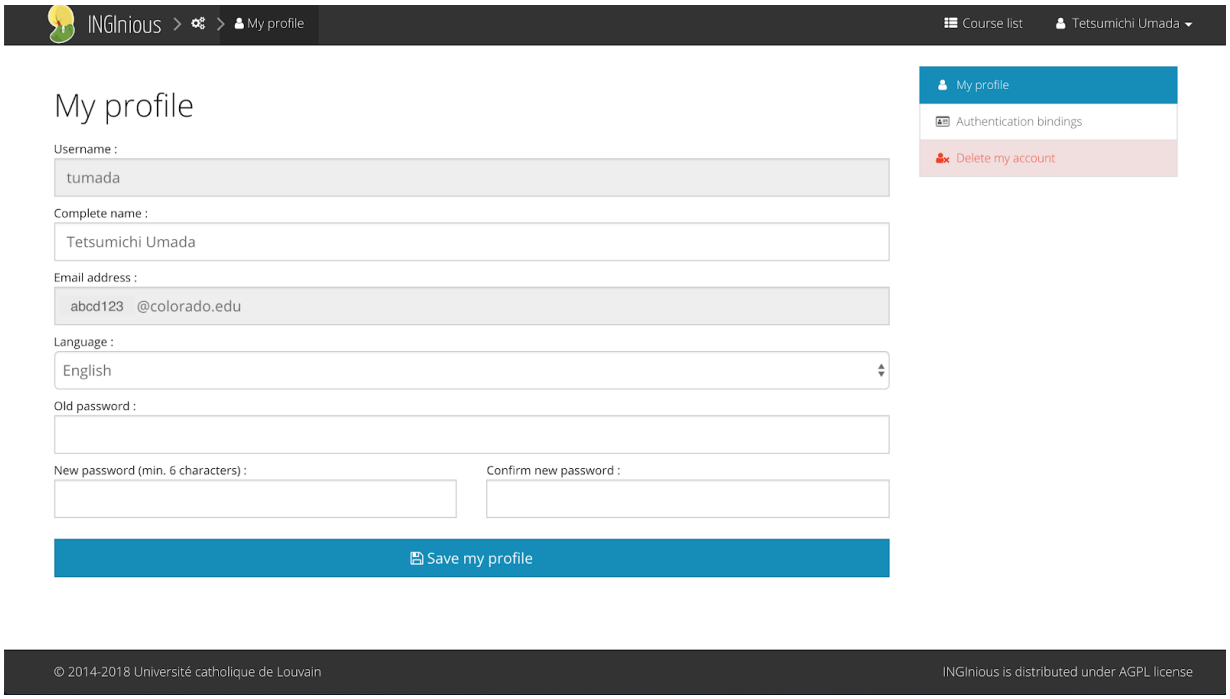
1. Click on the **"Homework 7 - Inginious"** link. Then, bind your INGInious account



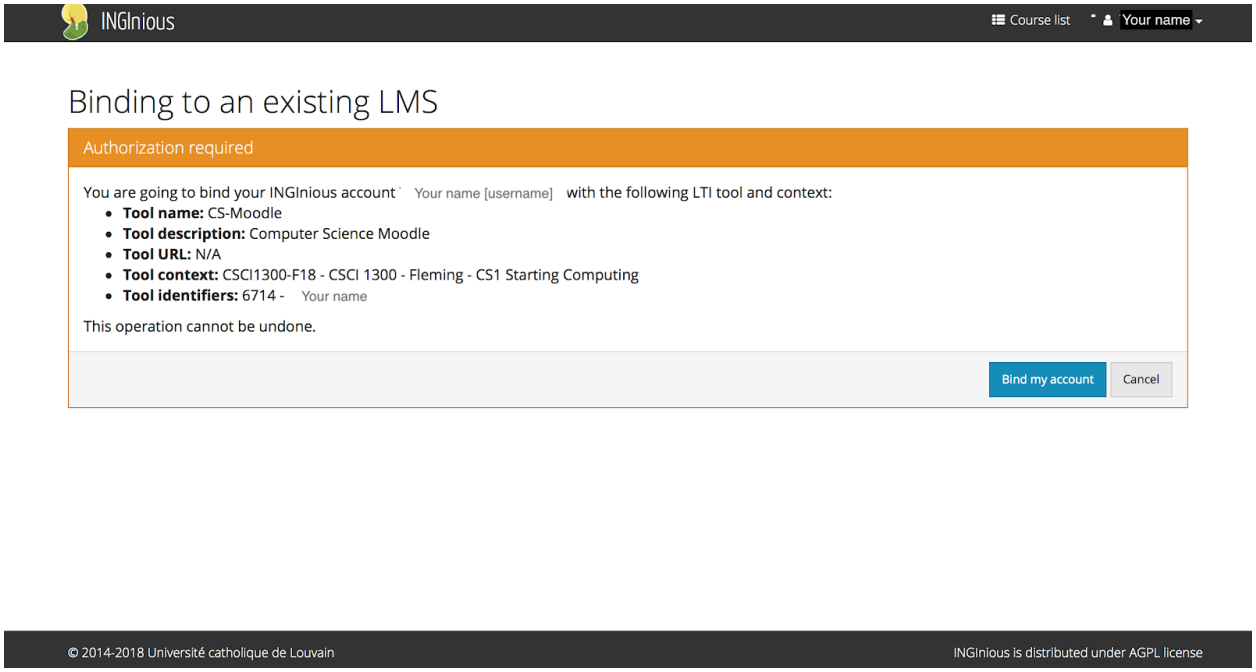
2. Choose “sign in with G”, and log-in with your colorado.edu identity key and password:



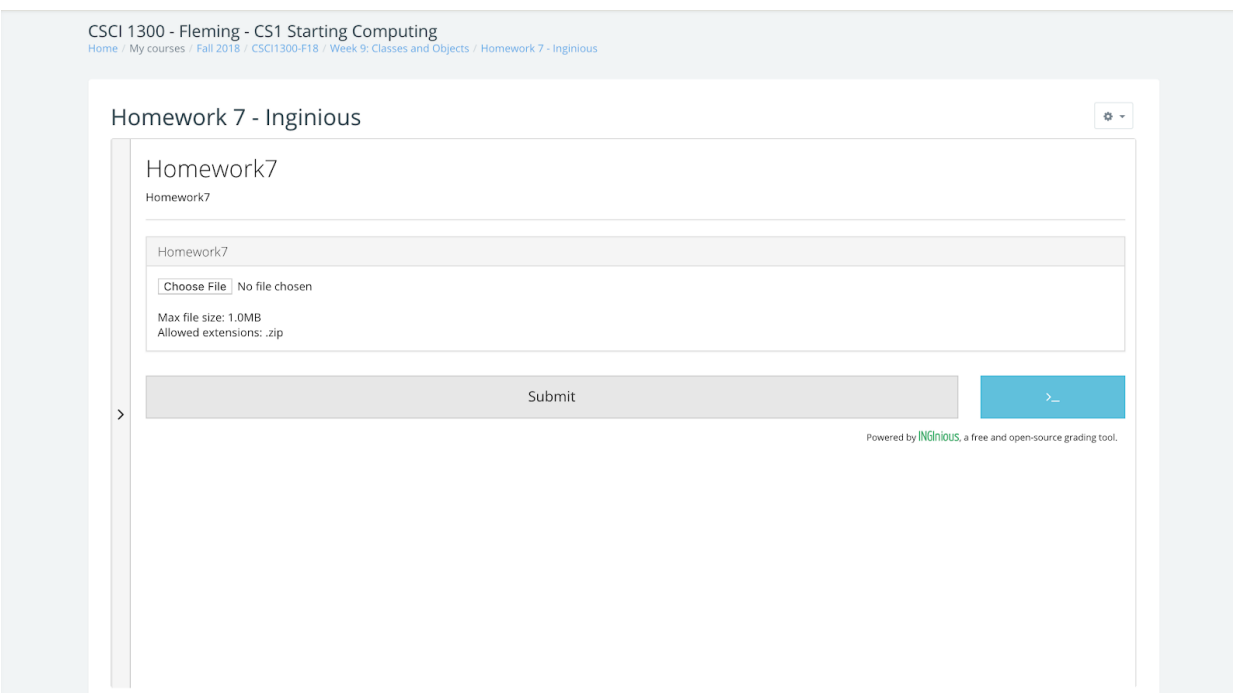
3. Choose a username:



4. After making an account, you need to go back to the submission link in Moodle, click it again, then Click Bind my account. Your should see a screen similar to the one below. Choose “Bind my account”

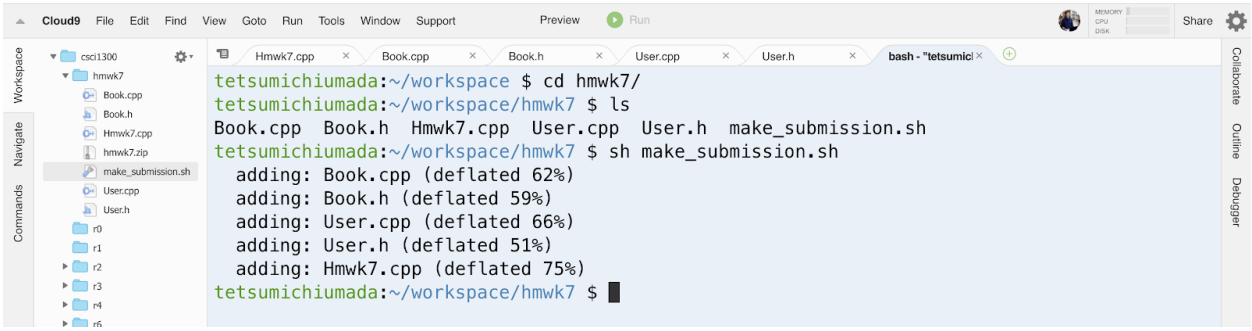


5. Then, you're ready to submit the zip file



6. **What you submit:**
   - The file name: hmwk7.zip
   - The zip file contains: Book.h, Book.cpp, User.h, User.cpp, Hmwk7.cpp
   - The name of each file should be the exactly the same (e.g. **B**ook.cpp, **B** is large B).

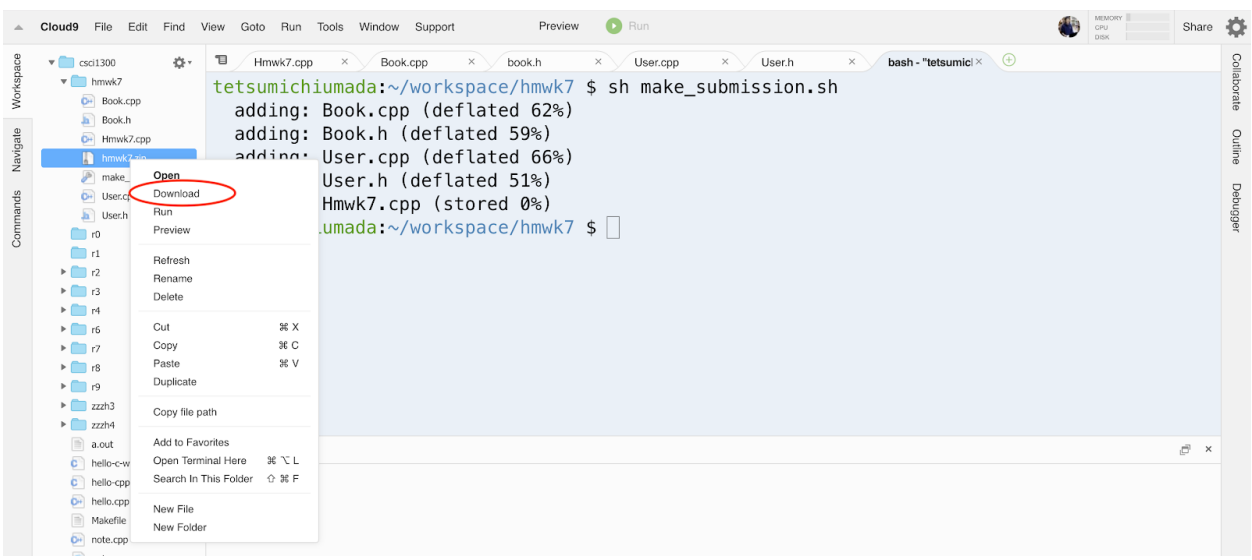
To make sure you won't worry about zipping and submitting the correct files, we created a shell script file you can use: `make_submission.sh`. Simply download the shell script from Moodle, upload it to Cloud9, and run it from your folder to create the `hmwk7.zip` file.



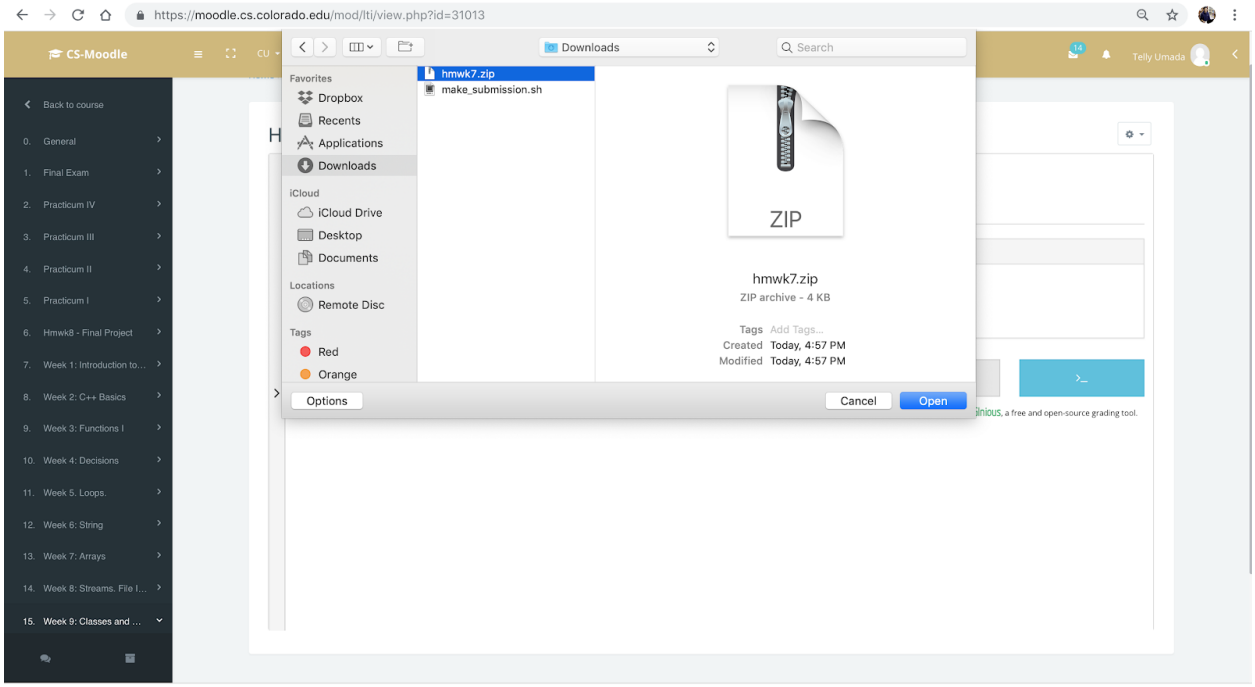
If filename is wrong, it gives a warning message. (it means your zip file does not contain necessary files)

```
tetsumichiumada:~/workspace/hmwk7 $ sh make_submission.sh
        zip warning: name not matched: Book.h
        zip warning: name not matched: Hmwk7.cpp
  adding: Book.cpp (deflated 62%)
  adding: User.cpp (deflated 66%)
  adding: User.h (deflated 51%)
tetsumichiumada:~/workspace/hmwk7 $
```

Then, download hmwk7.zip and upload it to INGInious



Note: Everytime you make a modification, you need to make a new zip file and download a new zip file and upload it to INGInious.



Sample output: (user can select 1, 2 or 6. The user input in the **bold**)

```
Select a numerical option:
======Main Menu=====
1. Read book file
2. Read user file
3. Print book list
4. Find number of books user rated
5. Get average rating
6. Quit
1
Enter a book file name:
wrongfile.txt
No books saved to the database

Select a numerical option:
======Main Menu=====
1. Read book file
2. Read user file
3. Print book list
4. Find number of books user rated
5. Get average rating
6. Quit
2
Enter a book file name:
this_does_not_exist.txt
```

```
No users saved to database

Select a numerical option:
======Main Menu=====
1. Read book file
2. Read user file
3. Print book list
4. Find number of books user rated
5. Get average rating
6. Quit
2
Enter a rating file name:
ratings.txt
cynthia...
diane...
joan...
( . . . truncated . . . )
raymond...
adam...
johnny...
Total users in the database: 86

Select a numerical option:
======Main Menu=====
1. Read book file
2. Read user file
3. Print book list
4. Find number of books user rated
5. Get average rating
6. Quit
1
Enter a book file name:
books.txt
Total books in the database: 50

Select a numerical option:
======Main Menu=====
1. Read book file
2. Read user file
3. Print book list
4. Find number of books user rated
5. Get average rating
6. Quit
3
```

```
Here is a list of books
The Hitchhiker's Guide To The Galaxy by Douglas Adams
Watership Down by Richard Adams
The Five People You Meet in Heaven by Mitch Albom
Speak by Laurie Halse Anderson
I Know Why the Caged Bird Sings by Maya Angelou
Thirteen Reasons Why by Jay Asher
Foundation Series by Isaac Asimov
( . . . truncated . . . )
Maus: A Survivor's Tale by Art Spiegelman
The Joy Luck Club by Amy Tan
The Lord of the Rings by J R R Tolkien

Select a numerical option:
======Main Menu=====
1. Read book file
2. Read user file
3. Print book list
4. Find number of books user rated
5. Get average rating
6. Quit
6
good bye!
```

Grading Rubric:

Criteria	Points
Autograder - Inginious Comments/Style	90 10
Total Early submission bonus	100 + 5% or 2%