

# Library Loans Management Design

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CSCE Homework #4  
CSCE 1040.003

# Class Relationships

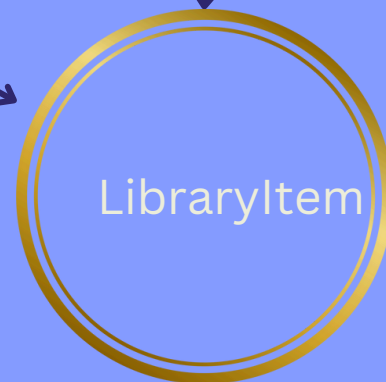
Contains the data for a Book. Derived from LibraryItem class.



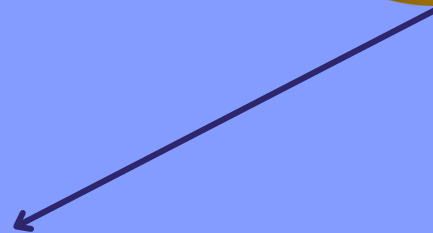
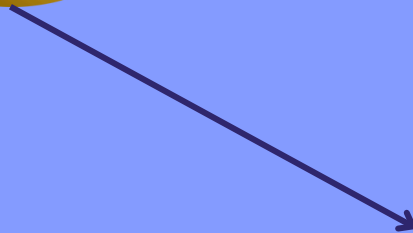
Contains the data for an Audio CD. Derived from LibraryItem class.



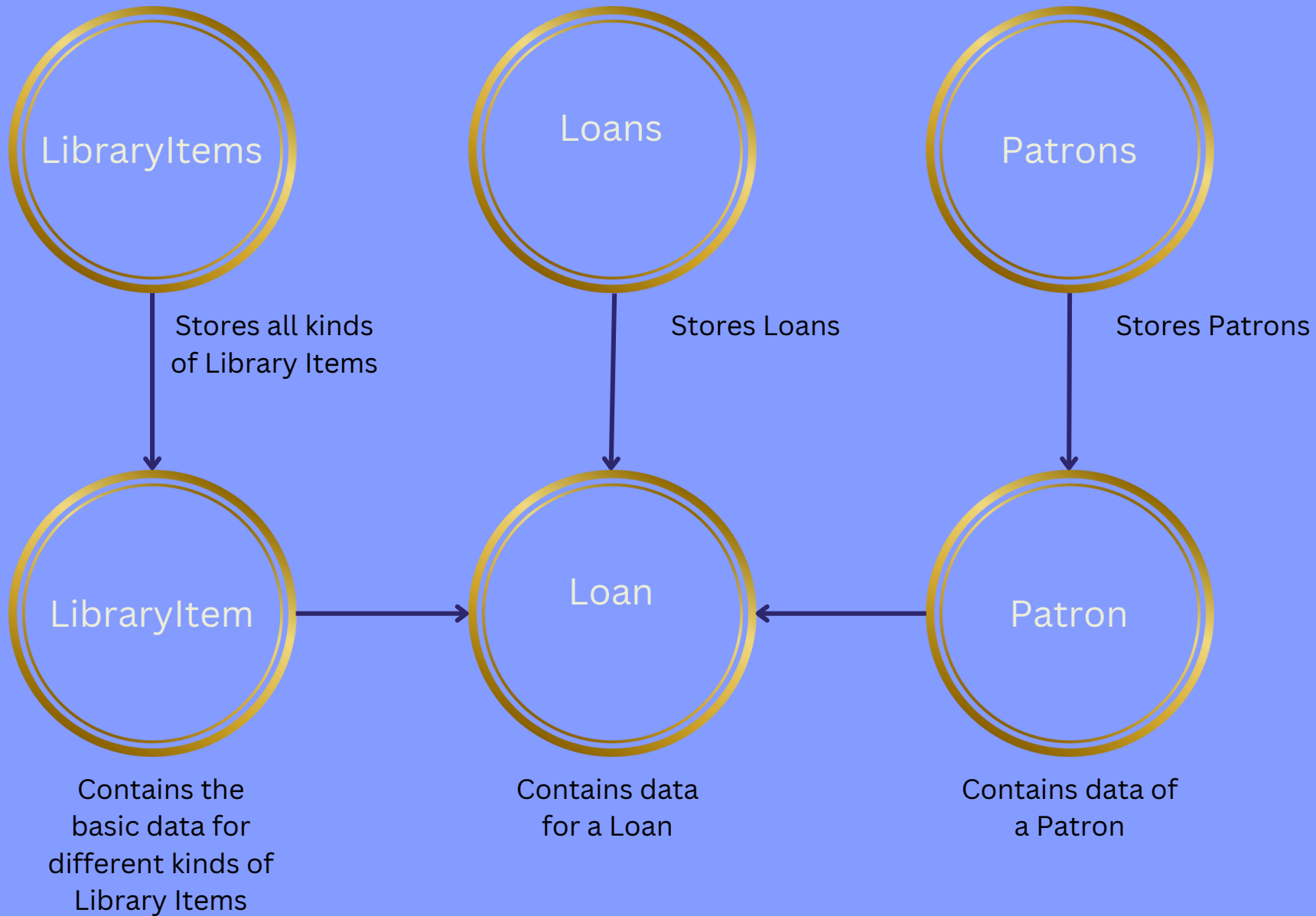
Contains the data for a DVD. Derived from LibraryItem class.



Contains the basic data for different kinds of Library Items (Book, Audio CD, DVD)

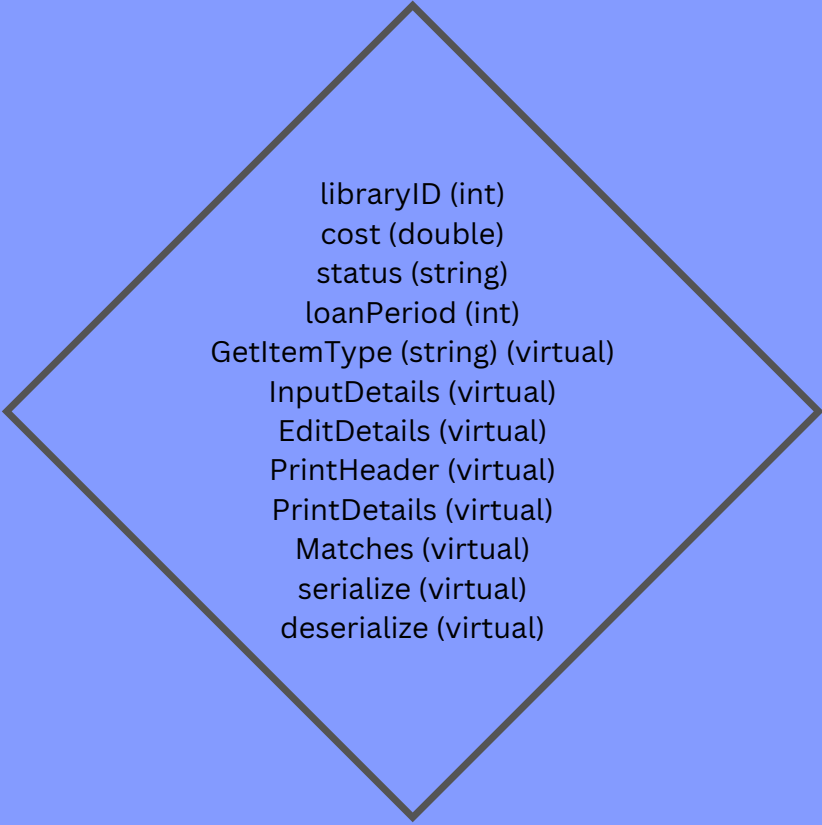


# Class Relationships



# Class Contents (LibraryItem and LibraryItems)


## *LibraryItem*



A diamond-shaped diagram representing the contents of the LibraryItem class. The diamond is outlined in a dark blue border. Inside the diamond, the following text is listed:

- libraryID (int)
- cost (double)
- status (string)
- loanPeriod (int)
- GetItemType (string) (virtual)
- InputDetails (virtual)
- EditDetails (virtual)
- PrintHeader (virtual)
- PrintDetails (virtual)
- Matches (virtual)
- serialize (virtual)
- deserialize (virtual)

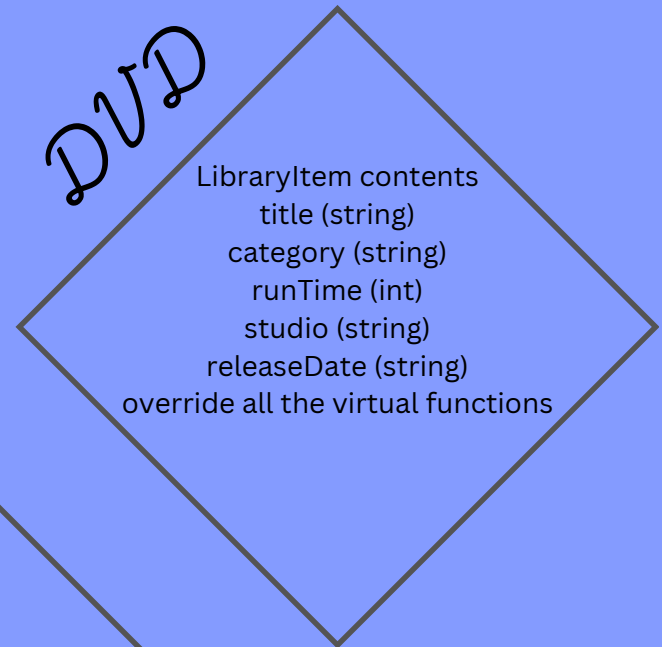
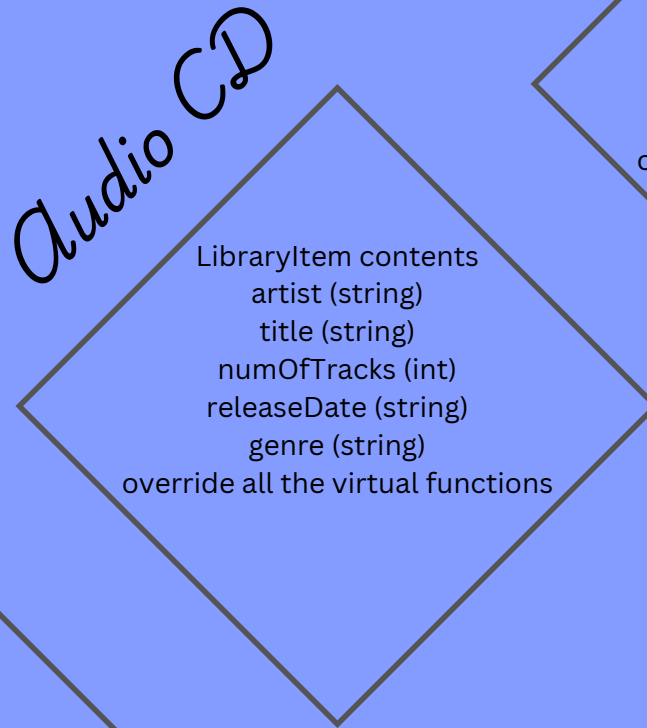
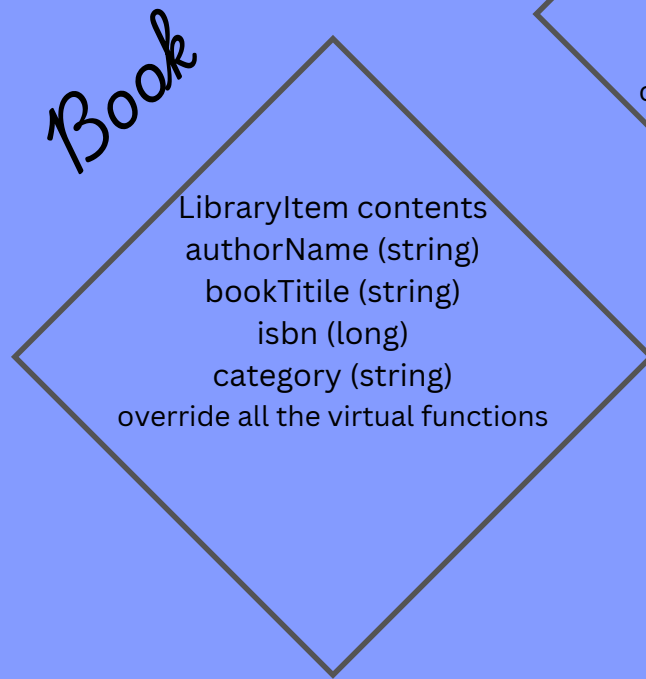
## *LibraryItems*



A diamond-shaped diagram representing the contents of the LibraryItems class. The diamond is outlined in a dark blue border. Inside the diamond, the following text is listed:

- LibraryItems (Destructor)
- Genrate Unique ID
- Generate Unique ISBN
- Add Item
- Edit Item
- Delete Item
- Find Item
- PrintAllItems
- PrintItem
- Ensure File Exists
- Save To File
- Load From File

# Class Contents (Book, Audio CD, DVD)



# Class Contents (Patron and Patrons)

*Patron*

Patron Name (string)  
ID Number (int)  
Fine Balance (double)  
Number of books checked out  
Display Header  
Display  
Increase Fine Balance  
Increase Books Checked Out  
Decrease Books Checked Out  
Serialize  
Deserialize

*Patrons*

List of Patrons (Patron vector)  
Generate Unique Patron ID  
Add Patron  
Edit Patron  
Delete Patron  
Search / Find Patron  
Print All Patron  
Print Patron  
Print Patrons With Fines  
Pay Fines  
Ensure File Exists  
Save To File  
Load From File

# Class Contents (Loan and Loans)

*Loan*

Loan ID (int)  
Book ID (int)  
Patron ID (int)  
Loan Status (string)  
Due Date (struct)  
Loan Status (string)  
Number Of Rechecks (int)  
Previous Overdue Days (int)  
Display  
Serialize  
Deserialize

*Loans*

List of loans (Loan vector)  
Is Loan Overdue (bool)  
Is Patron Overdue (bool)  
Has Other Loans Overdue (bool)  
Update Patron Fine Balance By Clock  
Check Out a book  
Check in a book  
Re-Check a book  
Edit Loan  
Report Lost Book  
List All Loans  
List All Overdue Loans  
List All Loans For Patron  
List All Overdue Loans For Patron  
Update Loan Status  
Update All Loans  
Ensure File Exists  
Save To File  
Load From File

# Function Pseudo Code

## Generate Item Type

returns the type of LibraryItem in string format

## Input Details

Determines what data to ask for with respect to the type of LibraryItem  
To be used with AddItem function

## Edit Details

Determines what data to ask for with respect to the type of LibraryItem  
To be used with EditItem function

## Matches

Determines if value passed in by user matches the user's chosen criteria with respect to the type of LibraryItem  
To be used with FindItem function



# Function Pseudo Code

Generate Unique Book ID

Using relevant functions

Generate a random number in a six digit range

Generate Unique ISBN

Using relevant functions

Generate a random number in a 9 digit range

Generate Unique Patron ID

Using relevant functions

Generate a random number in a 7 digit range

Ensure File Exists

Checks if the file corresponding to the data of the class exists

If it doesn't then it creates one  
LibraryItems (Book, DVD, Audio CD),  
Patrons and Loans should have one  
customized to their class

# Function Pseudo Code

## Save To File

Using the function serialize

It reads out the data corresponding to each class into their respective data file  
LibraryItems (Book, DVD, Audio CD),  
Patrons and Loans should have one customized to their class

## Load From File

Using the functions deserialize and ensure file exists

It reads in the data from the respective data files to the respective class  
LibraryItems (Book, DVD, Audio CD),  
Patrons and Loans should have one customized to their class

## Serialize

Determines how the data for each class type will be stored in the respective data file  
Book, DVD, Audio CD, Patron, and Loan should have one customized to their class

## Deserialize

Determines how the data for each class type will be read and store in their respective variables  
Book, DVD, Audio CD, Patron, and Loan should have one customized to their class

# Function Pseudo Code

## Print Header

This determines how the output of the header will look whenever the user chooses an option that requires the printing of information in the library data set

Book, DVD, Audio CD, Patron and Loan should have one customized to their class as needed

## Print Details

This determines how the output of the stored data respective to the class will be shown. It should be used whenever the user chooses an option that requires the printing of information in the library data set

Book, DVD, Audio CD, Patron and Loan should have one customized to their class as needed

## Print Patrons With Fines

Using Display Header and Display

If there are no Patrons with fines

Inform the user accordingly

Else

Display the header of the Patron class, and display the data of the patron using the display function pertaining to the Patron class.

## Is Loan Overdue

Takes in parameter of loan id

Checks if the loan is overdue based on the current date and the due date of the loan

If loan is overdue

return true

else

return false

# Function Pseudo Code

## Is Patron Overdue

Takes in the parameter of patron id  
Check if the patron has any overdue loans based on the current date and the due date of the loan  
If patron has any overdue loans  
return true  
else  
return false

## Has Other Loans Overdue

Takes in the parameter of loan id  
Check if the patron has any other overdue loans besides the one with the loan id we passed in, based on the current date and the due date of the loan  
If patron has any other overdue loans  
return true  
else  
return false

## Update Patron Fine Balance By Clock

Takes in the parameter of loan id  
Checks if the loan is overdue  
if true  
update the patron's fine balance based on days overdue

# Function Pseudo Code

## List All Loans

Checks if there are any loans in the system  
if true  
print out loans header then print out all loans information  
else  
inform user that there are no loans in the system

## List All Overdue Loans For Patron

Takes in parameter of patron ID  
Check if the patron has any overdue loans  
if true  
print out all the patrons overdue loans  
else  
inform user that the patron doesn't have any overdue loans

## Update All Loans

Goes through all the loans in the system and updates the data associated with them based on the current date  
If any loan is overdue it updates the patron fine balance respectively

## Get Current Date

Using relevant functions, return the current date in the real world in a string format of mm/dd/yy

# Function Pseudo Code

## Add Item

Prompt user for type of LibraryItem to add  
Prompt user for chosen LibraryItem 's details  
Set item's status to "In"  
Populate LibraryItem object with information  
Add object to collection

## Search / Find Item

Prompt user for type of LibraryItem to search  
Prompt user for criteria to search based on  
Check if criteria is appropriate  
if true  
    Print out all book's under that criteria  
else  
    Inform user that criteria could not be found

## Edit Item

Prompt user for Library ID number  
Check if LibraryItem exists in the Library  
if true  
    Prompt user for what edit they want to make  
    Prompt for new LibraryItem information based on user's previous choice  
    Populate LibraryItem object with information  
    Replace old LibraryItem object in library with new Item object  
else  
    Inform user that the LibraryItem could not be found

## Delete Item

Prompt user for Library ID number  
Check if LibraryItem exists in the library  
if true  
    Delete object from collection  
else  
    inform user that LibraryItem could not be found

# Function Pseudo Code

## Print All Items

Access LibraryItem stored in library  
Print out details of each LibraryItem neatly

## Print A Item

Prompt user for Library ID number  
Check if LibraryItem exists in the Library  
If LibraryItem exists  
    Print LibraryItem header and its details  
else  
    Inform user that LibraryItem could not be found

## Add Patron

Prompt user for name of Patron  
Prompt user for Patron ID number  
Set Fine balance to 0.00  
Set Current number of books out to 0  
Populate Patron object with information  
Add Patron object to collection

## Edit Patron

Prompt user for Patron ID  
Check if Patron exists in database  
if true  
    Prompt user for edit to make  
    Prompt user for the new information to replace with based on user's previous choice  
    Populate Patron object with information  
    Replace old Patron object in the database with new Patron object  
else  
    Inform user that the Patron could not be found

# Function Pseudo Code

## Delete Patron

```
Prompt user for Patron ID
Check if Patron exists in the database
if true
    Delete Patron object from collection
else
    inform user that Patron could not be found
```

## Search / Find Patron

```
Prompt user for criteria of Patron to search
with
Check if criteria is appropriate
if true
    Print out Patrons based on the criteria
else
    inform user that criteria could not be found
```

## Print All Patrons

```
Access Patrons stored in Patrons vector
Print out information for each patron in an
organized manner
```

## Print A Patron

```
Prompt user for Patron ID
Check if Patron exists in the database
if true
    Print Patron information
else
    inform user that Patron could not be found
```



# Function Pseudo Code

## Pay Fines (Patrons)

Prompt user for Patron ID Number

Check if Patron exists

if true

    Check if Patron has fines to pay

        if true

            Show total fines of Patron and prompt user  
            for how much they want to pay

            Take user input and subtract it from the  
            Patron's fines

        else

            Inform user that there are no fines under  
            the Patron's account

else

    Inform user that the Patron doesn't exist

## Report Lost LibraryItem (Loans)

Prompt user for Book ID number

Check if LibraryItem exists in the Library

if true

    set the LibraryItem's Current status to  
    "Lost"

    Charge Patron's fine balance for cost of the  
    LibraryItem

    Update Patron's current number of items  
    checked out

else

    Inform user that the LibraryItem isn't in the  
    library

## Print List of All Overdue Items (Loans)

Print all LibraryItem with the status of overdue in  
an organized manner

## Edit a Loan

Prompt user for Loan ID number

Check if Loan ID exists

if true:

    Prompt user for edit to make

    Prompt user for the new information to  
    replace with based on user's previous choice

    Populate Loan object with information

    Replace old Loan object in collection with  
    new Loan object

else

    Inform user that Loan could not be found

# Function Pseudo Code

## Print List of LibraryItems for a Patron (Loans)

Prompt user for Loan ID

Check if Loan ID exists in the collection

if true

Print all LibraryItems under to the Patron ID stored in the Loans collection

else

inform user that Loan ID could not be found

## Update Loan Status

Prompt user for Loan ID

Check if Loan ID exists in the collection

if true

Update Current Status for Loan based on system clock

else

inform user that Loan ID could not be found

## Re-Check Out an Item(Loans)

Prompt user Loan ID

Check if Loan ID exists

if true

Check if Patron has any LibraryItems that are overdue or if total LibraryItems checked out is

equal to

six

if false

Print list of Patron's checked out

LibraryItems

and prompt the user for the one they want to re-check out by name of the book

Update LibraryItem's status in LibraryItem's respective class

Update Due Date and Time

else

Inform user they can't check out new

LibraryItems if

they have overdue LibraryItems or have

already

checked out the max number of LibraryItems

possible

else

Inform user that Loan ID doesn't exist

# Function Pseudo Code

## Check In An Item (Loans)

```
Prompt user Patron ID
Check if Patron exists
if true
    Check if Patron has any LibraryItem's checked
    out or
    fines owed
    if true
        Print list of Patron's checked-out LibraryItem
    ,
    Patron's fines and prompt the user for the one
    they want to return by the id of the
    LibraryItem
    Update Patron current number of
    LibraryItems
    checked out
    Update respective LibraryItem's status in
    respective LibraryItem's class
    Delete loan in Loans class
else
    Inform user that Patron doesn't exist
```

## Check Out An Item (Loans)

```
Prompt user Loan ID
Check if Loan ID exists
if true
    Check if Patron has any LibraryItem that
    are overdue or if total LibraryItem checked
    out is equal to six
if false
    Print list of Patron's checked out
    LibraryItem
    and prompt the user for LibraryItem they
    want to check out by name of the
    LibraryItem
    Update Patron current number of
    LibraryItems checked out
    Update LibraryItem's status in respective
    LibraryItem's class
    Add a loan to Loans class
else
    Inform user they can't check out new
    LibraryItems if they have overdue
    LibraryItems or have
    already checked out the max number of
    LibraryItems possible
else
    Inform user that Loan ID doesn't exist
```

## *Design Experience*

I had fun with deriving new classes from my base class and seeing it implemented. I like the idea of putting things together from scratch for a purpose that serves people. After I finished the code, and there were no errors being highlighted by the software, it was time to test the program and make corrections. I loved this part especially because I got to see the fruits of my labor, and just getting to fine tune everything was worthwhile.