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Date: April 25, 2022
Instructor: Dr. Daniel M. Mejia
Programming Assignment 5

We confirm that the work of this assignment is completely our own. By turning in this assignment, we declare that we did not receive unauthorized assistance. Moreover, all deliverables including, but not limited to the source code, lab report, and output files were written and produced by our team alone.

1. **Program Explanation**

In this section, explain the overview of the assignment.

What did you do?

Our team merged codes and implemented a bank program. New customer information can be added to the program and it can read and store customers' information; name, address, date of birth, phone number, account number, account balance, credit limit, credit score, and id from a customer CSV file. Therefore, the customers can use features; inquire, deposit, withdraw, transfer, pay to someone, and shop in MinerMall by entering their pin to log in to the banking program. Also, a manager can log into the banking program by entering "0000" and uses this program to inquire about customer information, execute transactions, and create bank statements. When the user exit the program, it writes an updated user file.

How did you tackle the problem?

We used various classes to implement an object-oriented program. So, the program can have the customer and different types of account objects. Then we used interfaces to create the user, manager, and main menu features. Because of the interfaces, the main code only can be minimized and all the necessary data handling

methods are stored in the interfaces. Also, we check exceptions. Because this program interacts with user inputs, the program has to handle the exceptions to take proper incoming data.

What techniques did you use to solve the problem?

We used inheritance, encapsulation, abstraction, polymorphism, interface, design patterns, exception handling, and Junit testing.

Did you break the problem into smaller problems? Explain.

Yes, that is why I have different classes. For example, I started with the Transaction class, then after testing it was then implemented on the Menu class. So basically what I am saying is that I first tried solving the little problems which eventually help solve the big problem.

2. **What did I learn?**

What did you learn as a result of this assignment?

We learned deeper using inheritance such as that having a generic abstract class can help implement many other classes. Also, we learned about how to customize exceptions and how to implement different design patterns. We also learned how to work as a team and merge codes that are different.

How can my solution be improved?

Since we changed the login feature that was pointed from PA4, the solution is satisfactory. The only thing that we can improve, would be GUI functionality. This time we could not make it happen because there were so many things to be changed in the limited time.

What ideas do I have about another way to solve the problem?

I think that the user interface could have been improved and more organized. Also instead of writing two different menu classes for the user and the manager, everything could have been kept in the same class. Another thing that we could have changed is the way things are asked, by this I mean being more lenient as to what we ask the user to enter.

How long did it take me to complete this lab assignment?

About a total of 6 hours including refactoring the code and writing the lab.

3. **Solution Design**

What did I do in this program?

I wrote a loop, where I first figure out who is using the system. Then depending on user input, I send the user to different processes. Once decided if the user chooses manager then they are sent to the manager menu where they have multiple options. If it is a user then we ask them what they want to do until they log out, they have various options, and based on these options we log their interaction with the system, plus update their information.

What was my approach to solving this problem?

My approach to solving this problem was that populate a data structure with customers and their information. I wrote methods that handle processes based on user types. Also, I broke down the problem into smaller methods so that I can abstract away the functionality. Lastly, I also wrote methods that help read from and write to files.

What data structures did I use? Why?

I used two separate HashMaps as the container for Item and Customer and Item Objects. I did this because accessing is O(1). I also used other data structures such as an ArrayList to keep track of the customers' transactions, I did this because it is O(1) to access and add, and traversing is O(n).

What assumptions, if any, did I make?

I made a couple, the first one is that there has to be a way to identify the user, that is why I created a login option for the user to properly identify them mainly their name, id, and account number which I thought were the most unique attributes. The second assumption was that the Updated Customer Sheet.csv file has IDs from 1 to the last user. I also assumed that names did not have spaces because after reading through the file no user has that. Lastly, I assumed user inputs would not have many spaces such as entering their 3 names, I do note that this may cause some issues within the system. I assumed that the actions.csv transactions should be logged and that the actions.csv file could be executed in any order so I used a helper thread to execute it even faster.

4. **Testing**

How did I test my program?

I tested by testing methods and then, later on, brought everything together to test if they worked well together. I also tried entering random inputs to ensure that the exceptions were being handled correctly.

Did I use black-box, white-box testing, or both? Why?

Both because we wrote the code and ended up testing the system as a whole.

Did I test my solution enough? How can my testing practices be improved?

I think I did test my code enough, I was not able to find any more exceptions. I think the testing could have been improved by having random people outside of class testing the system just to see what they would do.

What are the test cases I used?

I tested the deposit, withdraw, transfer money, pay user, and buy item methods.

Did I break my program and use that as a way to improve it?

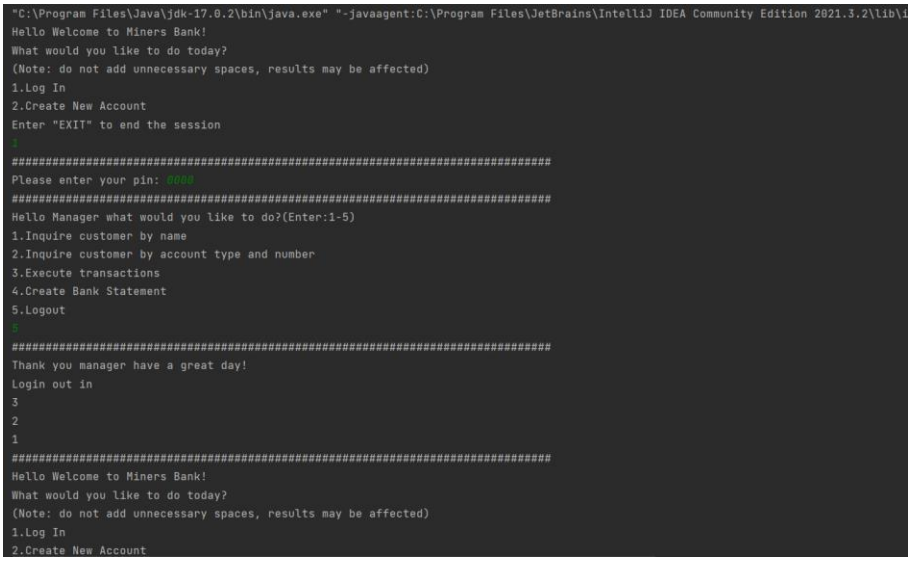
Yes, by breaking my code I was able to find exceptions and was able to handle them accordingly.

5. Test results

Describe the results of your tests.

The final test result was satisfactory. we tested the program with most of the possible edge cases and it handled all exceptions as we expected and the program did not break.

Include any console outputs showing your results

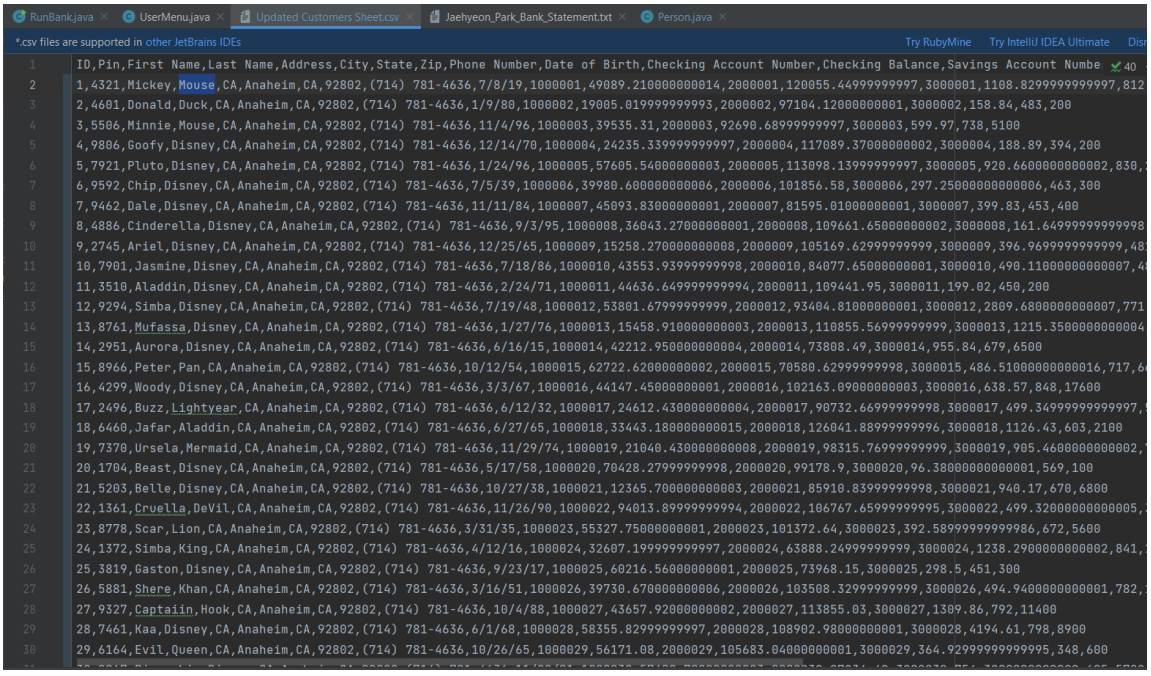


```
Error: Transaction puts you over the credit limit
Error: cannot deposit more than credit balance
Error: cannot deposit more than credit balance
Error: Transaction puts you over the credit limit
Error: cannot deposit more than credit balance
Error: Transaction puts you over the credit limit
Error: cannot deposit more than credit balance
Error: cannot deposit more than credit balance
Error: Transaction puts you over the credit limit
Error: Transaction puts you over the credit limit
Error: Transaction puts you over the credit limit
Error: Transaction puts you over the credit limit
Error: Transaction puts you over the credit limit
Error: cannot deposit more than credit balance
Error: cannot deposit more than credit balance
Error: Transaction puts you over the credit limit
Error: cannot deposit more than credit balance
Error: Transaction puts you over the credit limit
################################################################################
What else would you like to do today?
1.Inquire customer by name
2.Inquire customer by account type and number
3.Execute transactions
4.Create Bank Statement
5.Logout
3
################################################################################
Are you sure you want to execute transactions?(Y/N)
Action can take a while due to the log of every transaction to log.txt
```

```
------------------------------------------------
What else would you like to do today?
1.Inquire balance
2.Deposit
3.Transfer from an account to another
4.Withdraw
5.Pay another user
6.Go to Miners Mall
7.Logout
6
------------------------------------------------
Hello Welcome to Miners Mall
What would you like to do?(1-3)
1.View Items Menu
2.Buy Items
3.Exit mall
1
------------------------------------------------
ID: 1 Name: Grande Vanilla Iced Latte  Price: 4.87$ Stock: 30
ID: 2 Name: Trenta Shaken Caramel Iced Latte with half Oat Milk and half Almond Milk with 2.5 Pumps of Vanilla and whip  Price: 13.57$ Stock: 30
ID: 3 Name: Small Textbook  Price: 20.00$ Stock: 10
ID: 4 Name: Medium Textbook  Price: 50.00$ Stock: 5
ID: 5 Name: Large Textbook  Price: 100.00$ Stock: 3
ID: 6 Name: Parking Permit A  Price: 200.00$ Stock: 1
ID: 7 Name: Parking Permit B  Price: 250.00$ Stock: 1
ID: 8 Name: Parking Permit C  Price: 300.00$ Stock: 1
ID: 9 Name: UTEP Hoodie  Price: 29.99$ Stock: 4
ID: 10 Name: UTEP T-Shirt  Price: 19.97$ Stock: 10
ID: 11 Name: Macbook Pro  Price: 2100.00$ Stock: 2
ID: 12 Name: Pick N Shovel Meal  Price: 10.87$ Stock: 30
```

```
What would you like to do?(1-3)
1.View Items Menu
2.Buy Items
3.Exit mall
2
-------------------------------------------------
Enter the ID of the item you would like to add to the cart(Enter "C" to checkout or "E" to exit the mall)
11
Enter the ID of the item you would like to add to the cart(Enter "C" to checkout or "E" to exit the mall)
2
Enter the ID of the item you would like to add to the cart(Enter "C" to checkout or "E" to exit the mall)
45
Enter the ID of the item you would like to add to the cart(Enter "C" to checkout or "E" to exit the mall)
c
With which account would you like to pay?(Enter the name)
1.Checking
2.Credit
Checking
Please enter your pin
4573
Your purchase of 2185.31$ at Miners mall was a success!
Thank you!
-------------------------------------------------
What would you like to do?(1-3)
1.View Items Menu
2.Buy Items
3.Exit mall
```

Include any text document output as a result of your tests.



```
Name: Daniel Mejia
Address: TX, El Paso, TX 79968
Phone: (915) 747-5000
DOB: 3/29/63
ID: 37
Checking Account Number: 1000037   Current Checking Account Balance: 60372.96$
Savings Account Number: 2000037   Current Savings Account Balance: 104440.08$
Credit Account Number: 3000037   Current Credit Account Balance: 543.37$   Credit Score: 608   Credit Limit: 900
--------------------------------------------------------------------

Session Start: 2022/04/09 13:20:12
Starting Checking Balance: 2132.68$
Starting Savings Balance: 23228.05$
Starting Credit Balance: 63.70$

--------------------------------------------------------------------
Session End: 2022/04/09 13:21:18
Ending Checking Balance: 58126.12$
Ending Savings Balance: 104440.08$
Ending Credit Balance: 543.37$

--------------------------------------------------------------------
Account Activity
---------------
Daniel Mejia paid 901.75$ from their Checking account to Jason Lee into their Savings account at 2022/04/09 13:20:12

Daniel Mejia deposited 3143.47$ from their Checking account at 2022/04/09 13:20:12

Daniel Mejia purchased a Random Item 26 for 23.82$ from miners bank using their Checking account at 2022/04/09 13:20:12

Daniel Mejia deposited 1224.59$ from their Savings account at 2022/04/09 13:20:12
```

6. **Code Review**

Person One (Arturo Olmos)

How did you feel about your partner's code?

I think that it lacked a bit of robustness.

What are some things they did that you liked?

I liked some of his methods, for example, the generating the credit limit method was good and it was written in the appropriate class.

What were some things they did that you didn't like/didn't agree with?

As I said I did not like that his code lacked robustness and did not handle exceptions very well.

How did looking at another person's code change your understanding of the Bank system?

We have similar codes, but I realized that his user login was much less complex than mine and this helped.

Person Two (Jaehyeon Park)

How did you feel about your partner's code?

My partner's code was impressive because it handled most of the exceptions, used object-oriented concepts, and had all the comments on the method. That helped me to understand while I was reading them.

What are some things they did that you liked?

I liked how he structure his code and implement actual code based on the structure. Also, he used a separate class that handles different menus and utilities.

What were some things they did that you didn't like/didn't agree with?

The program takes the user's first name, last name, id, and all account numbers. It was implemented for security purposes, but I feel that would be inconvenient and can expect customers' complaints.

How did looking at another person's code change your understanding of the Bank system?

It had a similar idea and approach to solve the problem, but the details like what value would be the key for the hashmap and things were different. Because he used a user's full name for the key and asked for the account number to enter, the bank program did not have to search that information. Thus, the operating time could be reduced. Therefore, It helped me to extend my coding implementation knowledge.

7. **Reflection**

Describe the process of combining code

It was kind of easy. We just found methods that worked well between both of us and ended up merging them.

Describe the process of refactoring code

Refactoring was a bit tough, sometimes I wanted to get rid of certain things, but because our system was robust we had to keep some things that seemed to be redundant.

Describe the process of understanding your teammate's code

I tested their code and checked the functionality, then I proceeded to read their code to understand it even better.

Describe the problems you faced, and how you solved them

An issue was that we had to introduce a new design pattern and an interface shared by 2 classes. We ended up implementing the iterator design pattern, which uses an interface and is a design pattern that solved our problem.

8. **Demo of another team**

Who demo'd to you?

The Boolean Boys

Did you understand their process to perform tasks?

Yes

Did they provide you with Javadoc?

No, because they are still working on the code, but they had Javadoc for PA4

Did you break their code? How?

When I entered 200 for the item ID which is not in the list, the program was broken. And when inquiring about customer information as a manager, the program still showed the account selecting options. Then, when I select one of the account options, the program was broken with exception messages.

Did they meet all functionality requirements?

They are still working on the login functionality. It does not ask pin to log in yet.

9. **Demo for another team**

Who did you demo with?

The Boolean Boys

Did you provide them with enough information in the console prompts?

Yes

Did you provide them with Javadoc?

No, because they are still working on the code, but they had Javadoc for PA4

Did they break your code? What did you learn from it?

When I tried 200 for the item ID which is not in the list, the program was broken

When inquiring about customer information as a manager, the program still showed the account selecting options

Did you meet all the functionality requirements?

They are still working on the login functionality. It does not ask pin to log in yet.

Feedback:

Transaction: For the pay someone function, displaying a user is not found before asking for further information.

10. Contributions

Person One (Arturo Olmos)

What did I do to contribute to this?

I did the Class diagram, I wrote most of the code, I did the State Diagram, and I also did the documentation and generated the Javadoc.

How did I help solve the problem?

I helped by implementing the code that was demonstrated in the Class diagram.

How much did I do in this assignment?

I did quite a bit.

What did I learn from working with a teammate?

I learned that not everyone moves at the same pace and you have to be patient.

Person Two (Jaehyeon Park)

What did I do to contribute to this?

I made UML Use Case Diagram, use case scenarios, Junit test, and did the demo with another team, and helped Arturo's code implementation by creating customized exceptions, and methods and removing redundant code. Also, I participated making slides and writing the lab report.

How did I help solve the problem?

I searched for information and shared potential solutions with the team. I also kept checking how the project was going and what help was needed from the team. Also, I tried to follow the plan of action and communicated with the team.

How much did I do in this assignment?

One hour on Monday and Wednesdays, and a minimum of two hours for the rest of the weekdays.

What did I learn from working with a teammate?

I learned the satisfaction and achieving feeling with working with a good teammate.

Design Patterns used

We used the iterator and singleton design patterns. The iterator was used to iterate over a customer and item collections. The singleton was used in the Transactions class.