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Date: April 10, 2022
Instructor: Dr. Daniel M. Mejia
Programming Assignment 4

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. Also, a manager can use 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?

The program could be improved by making some changes to the user login process. We got some comments that it is hard to log in to the customer menu because it asks for first name, last name, id, checking account, savings account, and credit account. Those steps were for a more secured system, but some customers/ testers felt

inconvenience. I also think that the customer creation could have been more strict to simulate a more realistic experience.

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 populating 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 bringing everything together to test of 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?

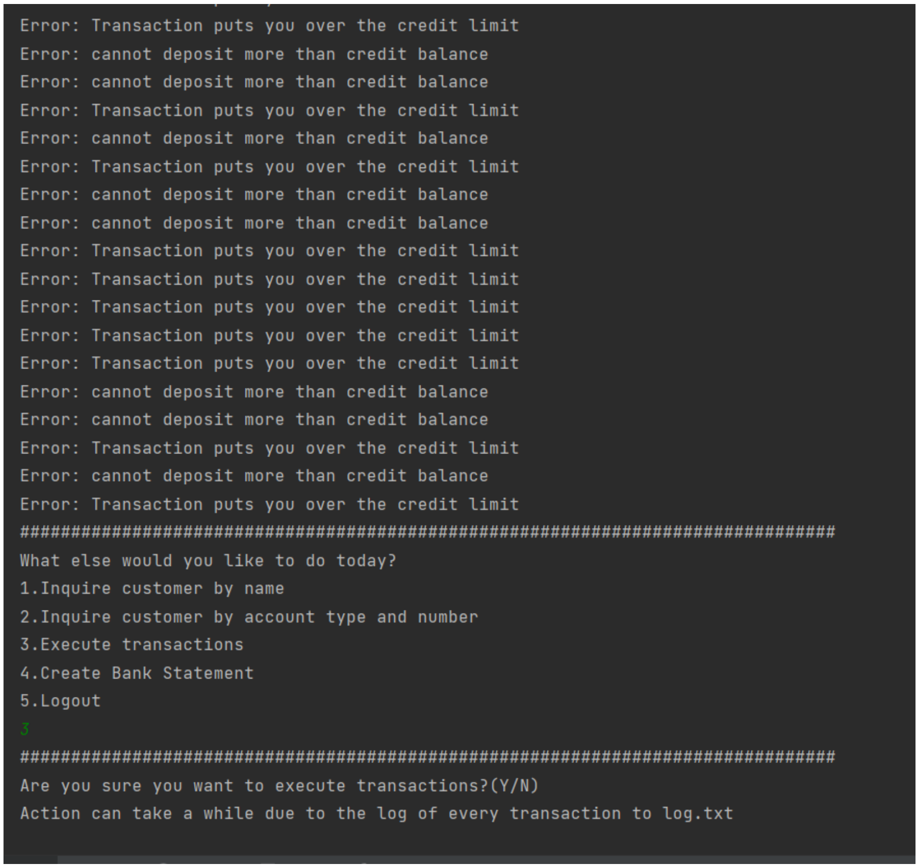
Yes, by breaking my code I was able to find exceptions and was able to handle them accordingly.

5. Test results

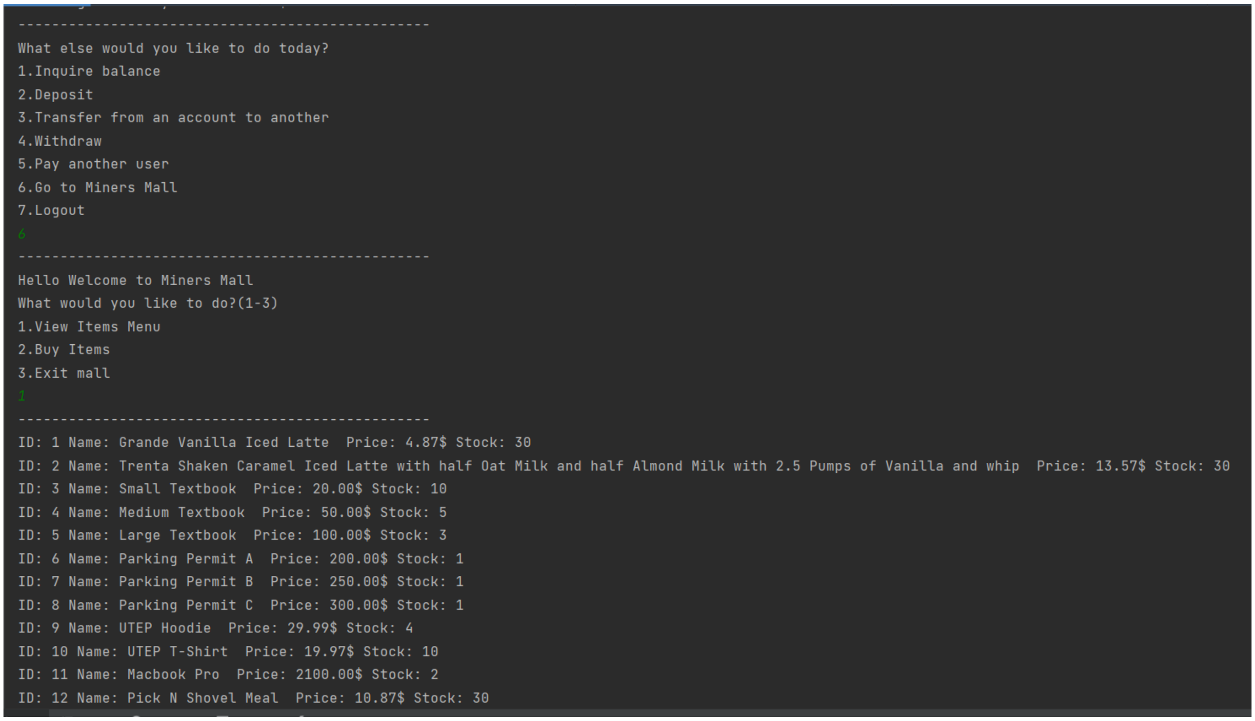
Describe the results of your tests.

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.

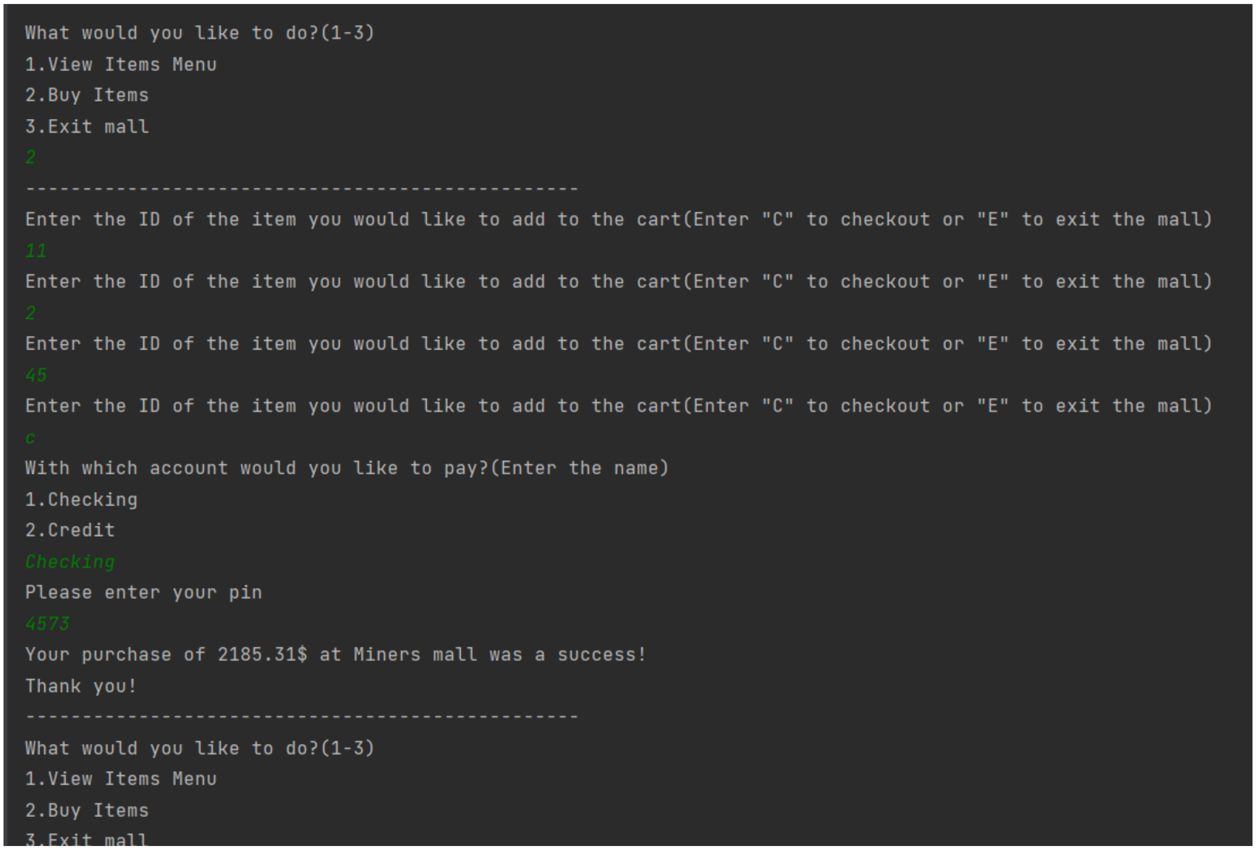
Include any console outputs showing your results



```
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
```

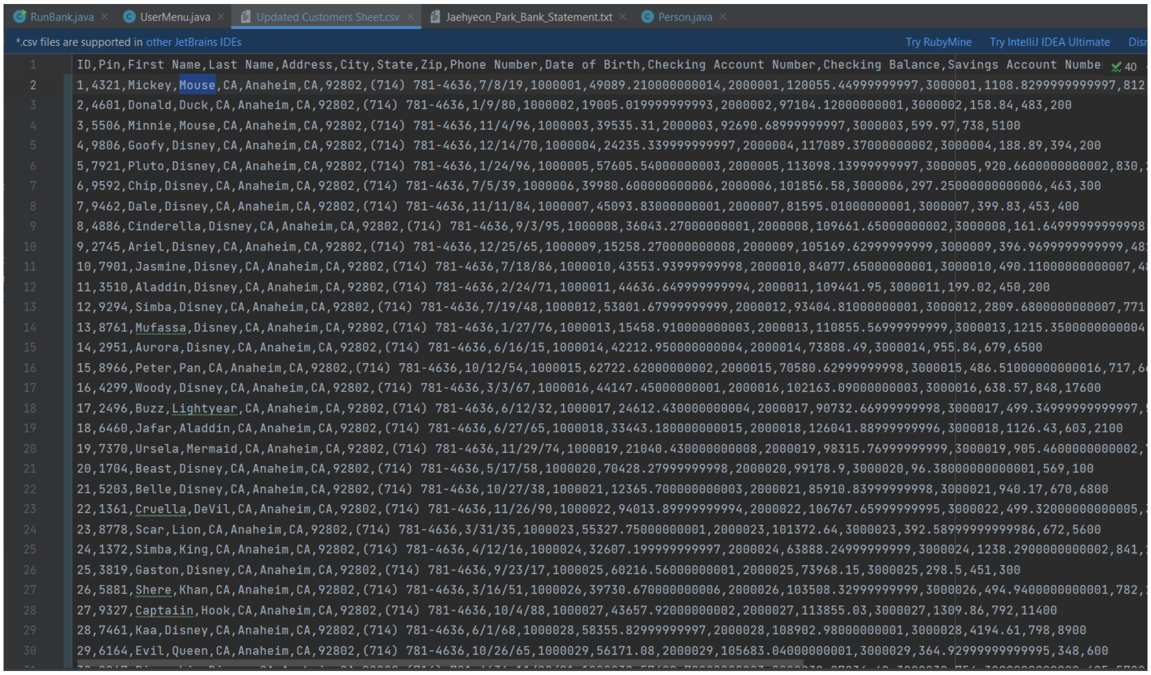


```
-------------------------------------------------
What else would you like to do today?
1.Inquire balance
2.Deposit
3.Transfer from an account to another
4.Withdraw
5.Pay another user
6.Go to Miners Mall
7.Logout
6
-------------------------------------------------
Hello Welcome to Miners Mall
What 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.


RunBank.java
UserMenu.java
Updated Customers Sheet.csv
Jaehyeon_Park_Bank_Statement.txt
Person.java
*.csv files are supported in other JetBrains IDEs
Try RubyMine
Try IntelliJ IDEA Ultimate
Dis
40

```
ID,Pin,First Name,Last Name,Address,City,State,Zip,Phone Number,Date of Birth,Checking Account Number,Checking Balance,Savings Account Numbe
1,4321,Mickey,Mouse,CA,Anaheim,CA,92802,(714) 781-4636,7/8/19,1000001,49089.210000000014,2000001,120055.44999999997,3000001,1108.8299999999997,812
2,4601,Donald,Duck,CA,Anaheim,CA,92802,(714) 781-4636,1/9/80,1000002,19005.019999999993,2000002,97104.12000000001,3000002,158.84,483,200
3,5506,Minnie,Mouse,CA,Anaheim,CA,92802,(714) 781-4636,11/4/96,1000003,39535.31,2000003,92690.68999999997,3000003,599.97,738,5100
4,9806,Goofy,Disney,CA,Anaheim,CA,92802,(714) 781-4636,12/14/70,1000004,24235.339999999997,2000004,117089.37000000002,3000004,188.89,394,200
5,7921,Pluto,Disney,CA,Anaheim,CA,92802,(714) 781-4636,1/24/96,1000005,57605.54000000003,2000005,113098.13999999997,3000005,920.6600000000002,830,
6,9592,Chip,Disney,CA,Anaheim,CA,92802,(714) 781-4636,7/5/39,1000006,39980.600000000006,2000006,101856.58,3000006,297.25000000000006,463,300
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14,2951,Aurora,Disney,CA,Anaheim,CA,92802,(714) 781-4636,6/16/15,1000014,42212.950000000004,2000014,73808.49,3000014,955.84,679,6500
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17,2496,Buzz,Lightyear,CA,Anaheim,CA,92802,(714) 781-4636,6/12/32,1000017,24612.430000000004,2000017,90732.66999999998,3000017,499.34999999999997,
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27,9327,Captaiin,Hook,CA,Anaheim,CA,92802,(714) 781-4636,10/4/88,1000027,43657.92000000002,2000027,113855.03,3000027,1309.86,792,11400
28,7461,Kaa,Disney,CA,Anaheim,CA,92802,(714) 781-4636,6/1/68,1000028,58355.82999999997,2000028,108902.98000000001,3000028,4194.61,798,8900
29,6164,Evil,Queen,CA,Anaheim,CA,92802,(714) 781-4636,10/26/65,1000029,56171.08,2000029,105683.04000000001,3000029,364.92999999999995,348,600
```

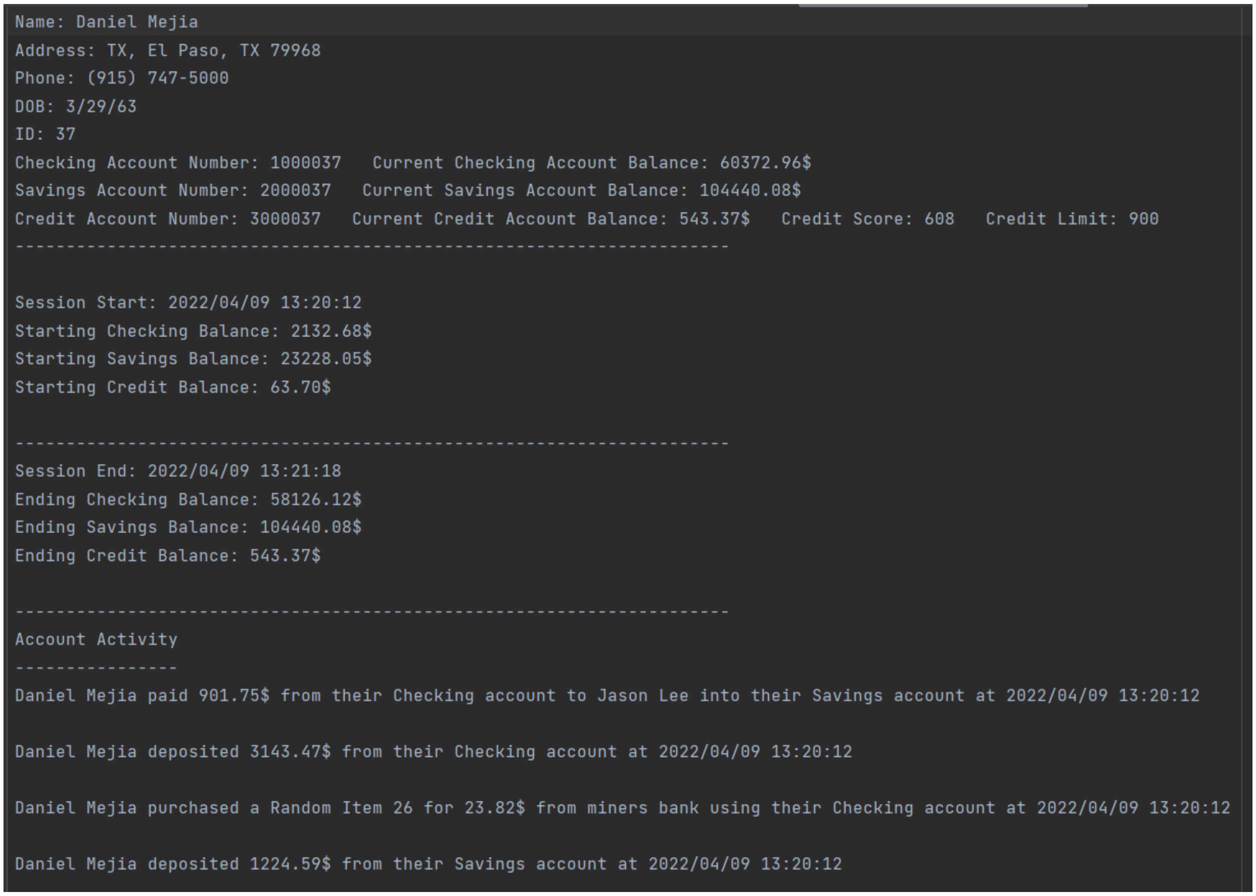

```
Name: Daniel Mejia
Address: TX, El Paso, TX 79968
Phone: (915) 747-5000
DOB: 3/29/63
ID: 37
Checking Account Number: 1000037   Current Checking Account Balance: 60372.96$
Savings Account Number: 2000037   Current Savings Account Balance: 104440.08$
Credit Account Number: 3000037   Current Credit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

Like 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 has 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, and 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.

Person Three (Miguel Ortiz)

How did you feel about your partner’s code?

n/a

What are some things they did that you liked?

n.a

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

n/a

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

n/a

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

Refractoring 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 which solved our problem.

8. **Demo of another team**

Who demo'd to you?

Team Pa4_sp22-hooli demo'd.

Did you understand their process to perform tasks?

Yes.

Did they provide you with Javadoc?

Yes.

Did you break their code? How? & How did you try to break it?

At first, I tested the program with proper inputs and checked all the functionalities worked as they should be. Then, I tried edge cases like typing character or string inputs when the program asked for integer inputs.

When logging out of the system, an error occurred and IllegalFormatConversion Exception appeared as well.

Did they meet all functionality requirements?

Yes, when they were giving the demo, it had some bugs but it had all the required functionalities.

What questions did you have about your classmate's functionality?

I asked about how to handle the user data, and when creating new users what types of information they take and store. Also, I was curious about what kind of design patterns they were using and what the time efficiency was.

What concerns do you have about your classmate's functionality?

Generally, it looked great. The most difference between their code and our code is that when a user logs in to the program, they allow a person can enter just by asking

name or ID. Then when entering the program it asks about what type of account it is using. therefore, when the user wants to access a different account, they have to re-log into the grogram.

9. **Demo for another team**

Who did you demo with?

Pa4_sp22-hooli.

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

I explained to him that to log in to the system as a customer, he needed to know the first name, last name, id, and account number for checking, savings, and credit. Then when selecting a type of account, it is required to type the name of the account. Viewing the menu in the Miner Mall is required before purchasing the first item. For creating a bank statement in the manager options, the system takes a full name with whitespace between the first name and the last name.

Did you provide them with Javadoc?

Yes.

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

Before doing the demo, our team tried to break down our program. During the process, we handled as many as exceptions possible. Therefore, the program was not broken during the demo.

Did you meet all the functionality requirements?

Yes. The program has a customer and manager menu. The user can do basic bank work in the system and visit the Miner Mall and purchase items.

FeedBack:

Transaction: Using receiver's Account instead of receiver’s id.

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, 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.

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.

<u>Person Three (Miguel Ortiz)</u>

What did I do to contribute to this?

Wrote a part of the lab report.

How did I help solve the problem?

n/a

How much did I do in this assignment?

n/a

What did I learn from working with a teammate?

n/a

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 various classes, such

as the utility class. We chose to use the singleton design pattern in classes that did not require multiple objects.