

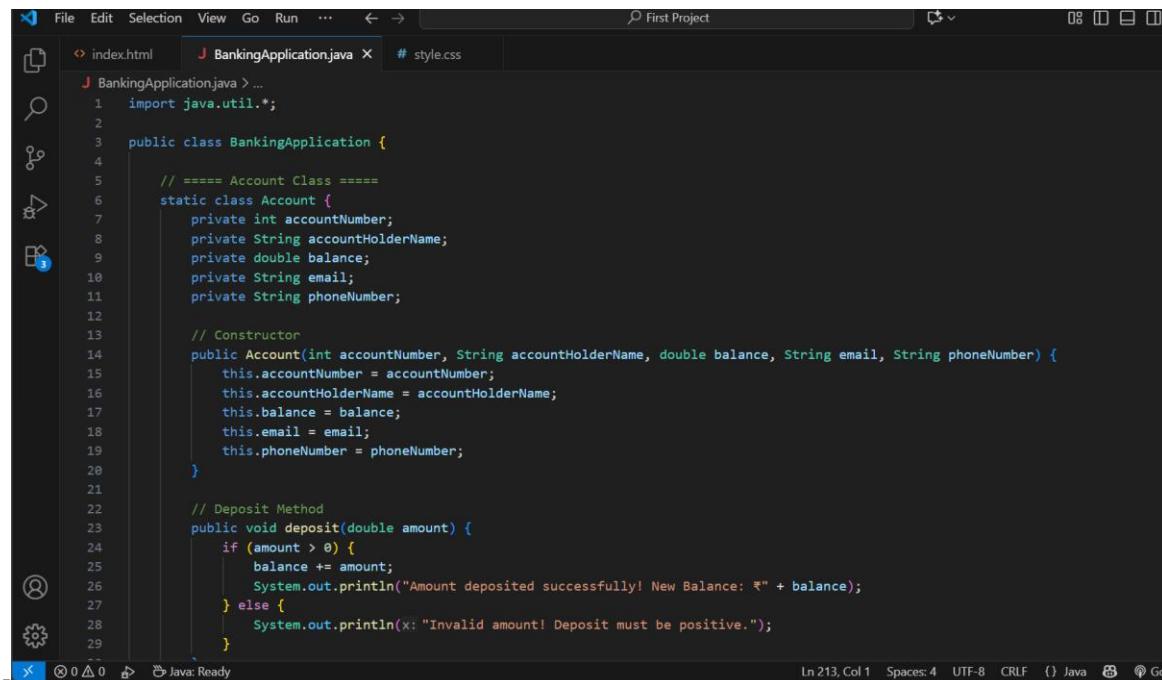
JAVA ASSIGNMENT NUMBER: 01

Name: **Aman**

Roll no: **2401201115**

Course: **BCA (AI&DS)**

INPUT

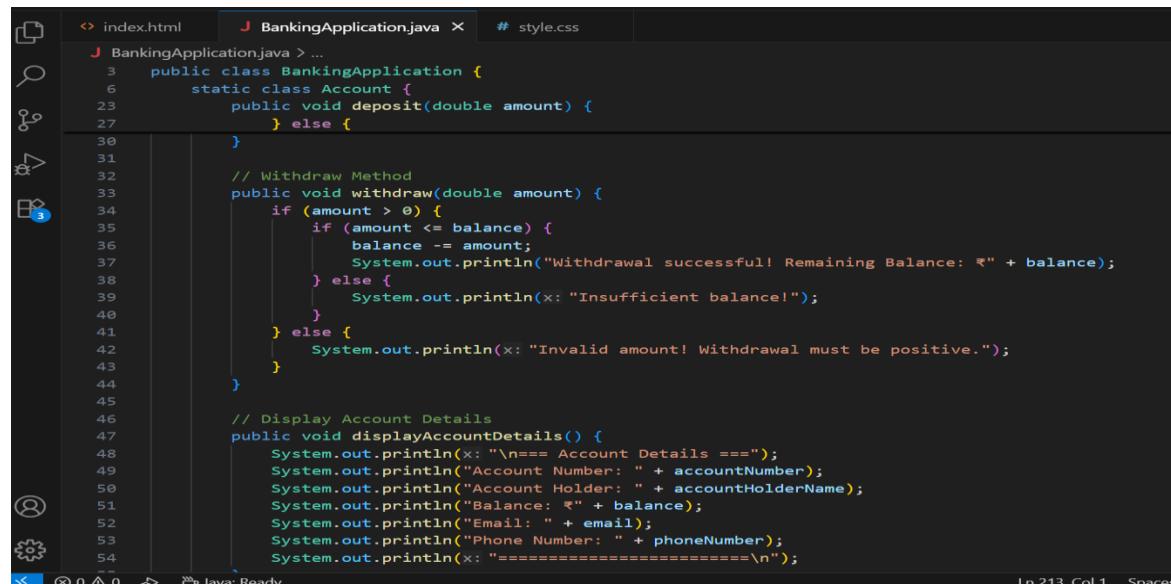


The screenshot shows a Java IDE interface with the following details:

- Project Bar:** First Project
- File List:** index.html, BankingApplication.java, style.css
- Code Editor:** The BankingApplication.java file is open, showing the following code:

```
1 import java.util.*;
2
3 public class BankingApplication {
4
5     // ===== Account Class =====
6     static class Account {
7         private int accountNumber;
8         private String accountHolderName;
9         private double balance;
10        private String email;
11        private String phoneNumber;
12
13        // Constructor
14        public Account(int accountNumber, String accountHolderName, double balance, String email, String phoneNumber) {
15            this.accountNumber = accountNumber;
16            this.accountHolderName = accountHolderName;
17            this.balance = balance;
18            this.email = email;
19            this.phoneNumber = phoneNumber;
20        }
21
22        // Deposit Method
23        public void deposit(double amount) {
24            if (amount > 0) {
25                balance += amount;
26                System.out.println("Amount deposited successfully! New Balance: ₹" + balance);
27            } else {
28                System.out.println("Invalid amount! Deposit must be positive.");
29            }
30        }
31
32        // Withdraw Method
33        public void withdraw(double amount) {
34            if (amount > 0) {
35                if (amount <= balance) {
36                    balance -= amount;
37                    System.out.println("Withdrawal successful! Remaining Balance: ₹" + balance);
38                } else {
39                    System.out.println("Insufficient balance!");
40                }
41            } else {
42                System.out.println("Invalid amount! Withdrawal must be positive.");
43            }
44        }
45
46        // Display Account Details
47        public void displayAccountDetails() {
48            System.out.println("\n==== Account Details ====");
49            System.out.println("Account Number: " + accountNumber);
50            System.out.println("Account Holder: " + accountHolderName);
51            System.out.println("Balance: ₹" + balance);
52            System.out.println("Email: " + email);
53            System.out.println("Phone Number: " + phoneNumber);
54            System.out.println("=====\n");
55        }
56    }
57}
```

The status bar at the bottom indicates: Line 213, Col 1 | Spaces: 4 | UTF-8 | CRLF | {} Java | Go



The screenshot shows a Java IDE interface with the following details:

- Project Bar:** First Project
- File List:** index.html, BankingApplication.java, style.css
- Code Editor:** The BankingApplication.java file is open, showing the following code (with additional methods compared to the previous screenshot):

```
1 import java.util.*;
2
3 public class BankingApplication {
4
5     static class Account {
6         public void deposit(double amount) {
7             if (amount > 0) {
8                 balance += amount;
9                 System.out.println("Amount deposited successfully! New Balance: ₹" + balance);
10            } else {
11                System.out.println("Invalid amount! Deposit must be positive.");
12            }
13        }
14
15        public void withdraw(double amount) {
16            if (amount > 0) {
17                if (amount <= balance) {
18                    balance -= amount;
19                    System.out.println("Withdrawal successful! Remaining Balance: ₹" + balance);
20                } else {
21                    System.out.println("Insufficient balance!");
22                }
23            } else {
24                System.out.println("Invalid amount! Withdrawal must be positive.");
25            }
26        }
27
28        public void displayAccountDetails() {
29            System.out.println("\n==== Account Details ====");
30            System.out.println("Account Number: " + accountNumber);
31            System.out.println("Account Holder: " + accountHolderName);
32            System.out.println("Balance: ₹" + balance);
33            System.out.println("Email: " + email);
34            System.out.println("Phone Number: " + phoneNumber);
35            System.out.println("=====\n");
36        }
37    }
38}
```

The status bar at the bottom indicates: Line 213, Col 1 | Spaces

The screenshot shows a Java code editor with the following code:

```
index.html J BankingApplication.java # style.css
J BankingApplication.java > ...
3  public class BankingApplication {
70     public static void main(String[] args) {
77         do {
80             System.out.println("1. Create a new account");
81             System.out.println("2. Deposit money");
82             System.out.println("3. Withdraw money");
83             System.out.println("4. View account details");
84             System.out.println("5. Update contact details");
85             System.out.println("6. Exit");
86             System.out.print("Enter your choice: ");
87             choice = sc.nextInt();
88             sc.nextLine(); // consume newline
89
90             switch (choice) {
91                 case 1:
92                     System.out.print("Enter account holder name: ");
93                     String name = sc.nextLine();
94
95                     System.out.print("Enter initial deposit amount: ");
96                     double balance = sc.nextDouble();
97                     sc.nextLine();
98
99                     System.out.print("Enter email address: ");
100                    String email = sc.nextLine();
101
102                    System.out.print("Enter phone number: ");
103                    String phone = sc.nextLine();
104
105                     accounts[accountCount] = new Account(nextAccountNumber++, name, balance, email, phone);
106                     System.out.println("Account created successfully with Account Number: " + accounts[accountCount].getAccountNumber());
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```

```
index.html | J BankingApplication.java | # style.css
BankingApplication.java > ...
3  public class BankingApplication {
70  public static void main(String[] args) {
77    do {
89      switch (choice) {
175      case 5:
179        Account accUpdate = null;
180        for (int i = 0; i < accountCount; i++) {
181          if (accounts[i].getAccountNumber() == accNoUpdate) {
182            accUpdate = accounts[i];
183            break;
184          }
185        }
186
187        if (accUpdate != null) {
188          System.out.print(s: "Enter new email address: ");
189          String newEmail = sc.nextLine();
190
191          System.out.print(s: "Enter new phone number: ");
192          String newPhone = sc.nextLine();
193
194          accUpdate.updateContactDetails(newEmail, newPhone);
195        } else {
196          System.out.println(x: "Account not found!");
197        }
198        break;
199
200      case 6:
201        System.out.println(x: "Thank you for using the Banking Application!");
202      default:
203        System.out.println(x: "Invalid choice");
204    }
205  }
206
207  static void displayMenu() {
208    System.out.println("1. Create a new account");
209    System.out.println("2. Deposit money");
210    System.out.println("3. Withdraw money");
211    System.out.println("4. View account details");
212    System.out.println("5. Update contact details");
213    System.out.println("6. Exit");
214  }
215
216  static void createAccount() {
217    System.out.print(s: "Enter account holder name: ");
218    String holderName = sc.nextLine();
219
220    System.out.print(s: "Enter initial deposit amount: ");
221    int depositAmount = sc.nextInt();
222
223    System.out.print(s: "Enter email address: ");
224    String email = sc.nextLine();
225
226    System.out.print(s: "Enter phone number: ");
227    String phone = sc.nextLine();
228
229    Account newAccount = new Account(holderName, depositAmount, email, phone);
230    accounts.add(newAccount);
231
232    System.out.println(x: "Account created successfully with Account Number: " + newAccount.getAccountNumber());
233  }
234
235  static void depositMoney() {
236    System.out.print(s: "Enter account number: ");
237    int accountNumber = sc.nextInt();
238
239    for (int i = 0; i < accountCount; i++) {
240      if (accounts[i].getAccountNumber() == accountNumber) {
241        System.out.print(s: "Enter deposit amount: ");
242        int depositAmount = sc.nextInt();
243
244        accounts[i].deposit(depositAmount);
245
246        System.out.println(x: "Deposit successful");
247        break;
248      }
249    }
250  }
251
252  static void withdrawMoney() {
253    System.out.print(s: "Enter account number: ");
254    int accountNumber = sc.nextInt();
255
256    for (int i = 0; i < accountCount; i++) {
257      if (accounts[i].getAccountNumber() == accountNumber) {
258        System.out.print(s: "Enter withdrawal amount: ");
259        int withdrawalAmount = sc.nextInt();
260
261        accounts[i].withdraw(withdrawalAmount);
262
263        System.out.println(x: "Withdrawal successful");
264        break;
265      }
266    }
267  }
268
269  static void viewDetails() {
270    System.out.print(s: "Enter account number: ");
271    int accountNumber = sc.nextInt();
272
273    for (int i = 0; i < accountCount; i++) {
274      if (accounts[i].getAccountNumber() == accountNumber) {
275        System.out.println(accounts[i].toString());
276        break;
277      }
278    }
279  }
280
281  static void updateDetails() {
282    System.out.print(s: "Enter account number: ");
283    int accountNumber = sc.nextInt();
284
285    for (int i = 0; i < accountCount; i++) {
286      if (accounts[i].getAccountNumber() == accountNumber) {
287        System.out.print(s: "Enter new email address: ");
288        String newEmail = sc.nextLine();
289
290        System.out.print(s: "Enter new phone number: ");
291        String newPhone = sc.nextLine();
292
293        accounts[i].updateContactDetails(newEmail, newPhone);
294
295        System.out.println(x: "Contact details updated successfully");
296        break;
297      }
298    }
299  }
300
301  static void exit() {
302    System.out.println(x: "Thank you for using the Banking Application!");
303  }
304
305  static void main() {
306    displayMenu();
307
308    choice = sc.nextInt();
309
310    switch (choice) {
311      case 1:
312        createAccount();
313        break;
314
315      case 2:
316        depositMoney();
317        break;
318
319      case 3:
320        withdrawMoney();
321        break;
322
323      case 4:
324        viewDetails();
325        break;
326
327      case 5:
328        updateDetails();
329        break;
330
331      case 6:
332        exit();
333        break;
334
335      default:
336        System.out.println(x: "Invalid choice");
337    }
338  }
339
340  static void close() {
341    sc.close();
342  }
343}
```

OUTPUT

```
209
210      sc.close();
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
1. Create a new account
2. Deposit money
3. Withdraw money
4. View account details
5. Update contact details
6. Exit
Enter your choice: 1
Enter account holder name: aman
Enter initial deposit amount: 1000
Enter email address: amanuoadhaya0521@gmail.com
Enter phone number: 7675454241
Account created successfully with Account Number: 1001
```

Explanation —

1) High-level design

- The application models bank accounts with an `Account` class and provides a console menu (create, deposit, withdraw, view, update, exit).
 - Data storage: a `Map<Integer, Account>` (`HashMap`) stores accounts keyed by account number for fast lookup.
 - Money is represented with `BigDecimal` (not `double`) to avoid floating-point rounding errors.
 - Input/validation is centralized in helper methods to keep the `main` loop clean and robust.
-

2) `Account` class — data & behavior

Key fields:

- `private final int accountNumber;` — immutable account id once created.
- `private final String accountHolderName;` — holder name set once.
- `private BigDecimal balance;` — monetary balance stored precisely with `BigDecimal`.
- `private String email;` and `private String phoneNumber;` — contact info editable.

Constructor:

- Accepts `BigDecimal` initial balance and sets scale (`setScale(2, RoundingMode.HALF_EVEN)`) to represent currency with two decimal places and a standard rounding mode.

Behavior methods:

- `deposit(BigDecimal amount)`: checks `amount > 0` using `compareTo`, adds to balance, re-applies scale, prints confirmation.
- `withdraw(BigDecimal amount)`: checks positivity and sufficient funds (`amount.compareTo(balance) <= 0`), subtracts, re-applies scale, prints result; otherwise prints errors.
- `displayAccountDetails()`: prints account fields (safe console display).
- `updateContactDetails(String, String)`: updates email/phone.
- `getAccountNumber()`: accessor for map key operations.

Why `BigDecimal`?

- `double` is binary floating point and can't exactly represent many decimal monetary values → rounding errors. `BigDecimal` stores exact decimal values and is the right tool for financial arithmetic.

Why `final` on some fields?

- `final` provides immutability guarantees for `accountNumber` and `accountHolderName`, preventing accidental reassignment after construction.
-

3) Input & validation helpers

Helpers centralize parsing and validation so `main` stays readable:

- `readAmount(String prompt)`: loops until user enters a valid decimal number; returns `BigDecimal` with scale 2. Handles bad formats (catches `NumberFormatException`) rather than crashing.
- `readInt(String prompt)`: safely parses integers (menu choice, account numbers) using a loop and `Integer.parseInt`.
- `readNonEmpty(String prompt)`: enforces non-empty strings for name/email/phone.
- `isValidEmail(String)` and `isValidPhone(String)`: simple regex checks (not perfect but prevents obvious bad input). Phone accepts 7–15 digits; email uses a `\S+@\S+\.\S+`-style pattern.

Benefits:

- Centralized validation reduces duplicated code and the chance of inconsistent checks.
 - Defensive reading prevents `InputMismatchException` and makes the UX friendlier.
-

4) Storage: `Map<Integer, Account>` (`HashMap`)

- Accounts are stored in a `HashMap` keyed by `accountNumber`.
 - Lookup complexity: average $O(1)$ to get an account by account number (`accounts.get(accNo)`).
 - Contrast with previous array + linear search ($O(n)$): map makes deposit/withdraw/view/update operations scale much better.
-

5) Main loop & operations

- Menu loop reads a user choice (safe via `readInt`) and switches on it.
- Create account:
 - Read name, initial deposit, email, phone with validation.
 - Build `Account` with `nextAccountNumber` and `accounts.put(nextAccountNumber, acc)`.
 - Increment `nextAccountNumber`.
- Deposit / Withdraw / View / Update:
 - Read account number with `readInt`.

- o `accounts.get(accNo)` returns the `Account` or `null`.
 - o If found, call the relevant `Account` method (`deposit/withdraw/display/update`).
 - o If not found, print "Account not found!".
- Exit closes scanner and ends loop.