

## Day 21: Manisha Assignment

### Task 1: Establishing Database Connections

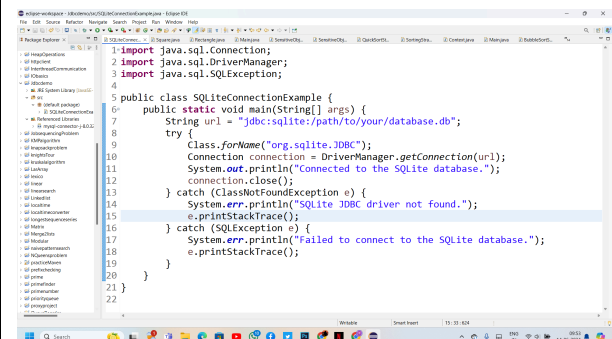
Write a Java program that connects to a SQLite database and prints out the connection object to confirm successful connection.

#### Execution Flow

1. The program starts execution from the `main` method.
2. The JDBC URL for the SQLite database is defined.
3. The program attempts to load the SQLite JDBC driver.
4. If the driver is successfully loaded, it attempts to establish a connection to the SQLite database using the specified URL.
5. If the connection is successful, a message indicating successful connection is printed, and the connection is closed.
6. If the JDBC driver is not found, an error message is printed, and the stack trace is displayed.
7. If there is an error while connecting to the database, an error message is printed, and the stack trace is displayed.

Make sure to replace `"/path/to/your/database.db"` with the actual path to your SQLite database file. Additionally, ensure that the SQLite JDBC driver is included in your project's build path.

#### Here the output of the code



```
1 import java.sql.Connection;
2 import java.sql.DriverManager;
3 import java.sql.SQLException;
4
5 public class SQLiteConnectionExample {
6     public static void main(String[] args) {
7         String url = "jdbc:sqlite:/path/to/your/database.db";
8         try {
9             Class.forName("org.sqlite.JDBC");
10            Connection connection = DriverManager.getConnection(url);
11            System.out.println("Connected to the SQLite database.");
12            connection.close();
13        } catch (ClassNotFoundException e) {
14            System.err.println("SQLite JDBC driver not found.");
15            e.printStackTrace();
16        } catch (SQLException e) {
17            System.err.println("Failed to connect to the SQLite database.");
18            e.printStackTrace();
19        }
20    }
21 }
22 }
```

java

```
import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.SQLException;
```

These import statements are necessary for using JDBC classes and interfaces. `Connection` is used to establish a connection to the database, `DriverManager` manages a list of database drivers, and `SQLException` handles SQL-related errors.

java

```
public class SQLiteConnectionExample {
    public static void main(String[] args) {
        String url =
"jdbc:sqlite:/path/to/your/database.db";
This is the main class named
`SQLiteConnectionExample` with a `main`
method, which serves as the entry point
for the program. The `url` variable holds
the JDBC URL to the SQLite database file.
```

## Task 2: SQL Queries using JDBC

Create a table 'User' with a following schema 'User ID' and 'Password' stored as hash format (note you have research on how to generate hash from a string), accept "User ID" and "Password" as input and check in the table if they match to confirm whether user access is allowed or not.

### Explanation:

#### 1. Hashing the Password:

- We use the `MessageDigest` class to hash the password with the SHA-256 algorithm.
- The `hashPassword` method takes a plain text password and returns its hashed version.

#### 2. Storing Users:

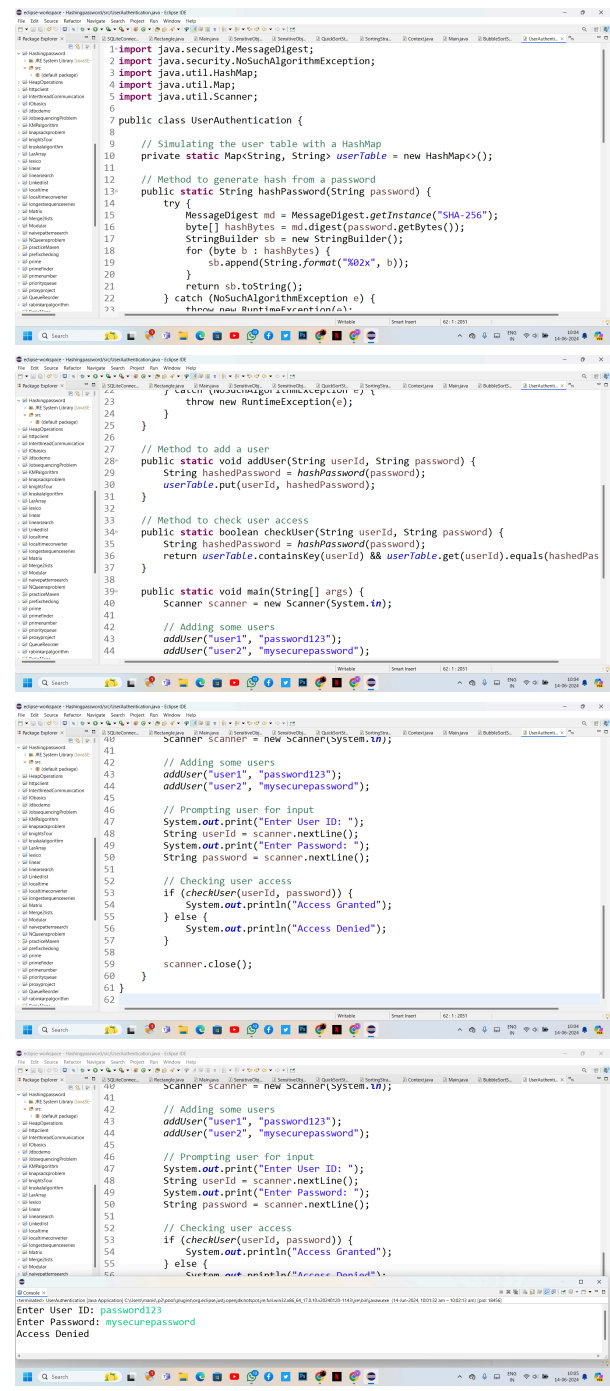
- We use a `HashMap` called `userTable` to simulate storing user IDs and hashed passwords.
- The `addUser` method adds a new user by hashing the provided password and storing the user ID and hashed password in the map.

#### 3. Checking User Access:

- The `checkUser` method takes a user ID and password, hashes the password, and checks if the user ID exists in the map and if the hashed password matches the stored hash.

#### 4. User Interaction:

- In the `main` method, we add a couple of users for demonstration.
- We prompt the user for their ID and password and check if they match using the `checkUser` method.
- Depending on the result, we print "Access Granted" or "Access Denied".



```
1 import java.security.MessageDigest;
2 import java.security.NoSuchAlgorithmException;
3 import java.util.HashMap;
4 import java.util.Scanner;
5
6 public class UserAuthentication {
7     // Simulating the user table with a HashMap
8     private static Map<String, String> userTable = new HashMap<>();
9
10    // Method to generate hash from a password
11    public static String hashPassword(String password) {
12        try {
13            MessageDigest md = MessageDigest.getInstance("SHA-256");
14            byte[] hashBytes = md.digest(password.getBytes());
15            StringBuilder sb = new StringBuilder();
16            for (byte b : hashBytes) {
17                sb.append(String.format("%02x", b));
18            }
19            return sb.toString();
20        } catch (NoSuchAlgorithmException e) {
21            throw new RuntimeException(e);
22        }
23    }
24
25    // Method to add a user
26    public static void addUser(String userId, String password) {
27        String hashedPassword = hashPassword(password);
28        userTable.put(userId, hashedPassword);
29    }
30
31    // Method to check user access
32    public static boolean checkUser(String userId, String password) {
33        String hashedPassword = hashPassword(password);
34        return userTable.containsKey(userId) && userTable.get(userId).equals(hashedPassword);
35    }
36
37    public static void main(String[] args) {
38        Scanner scanner = new Scanner(System.in);
39
40        // Adding some users
41        addUser("user1", "password123");
42        addUser("user2", "mysecurepassword");
43
44        Scanner scanner = new Scanner(System.in);
45
46        // Adding some users
47        addUser("user1", "password123");
48        addUser("user2", "mysecurepassword");
49
50        // Prompting user for input
51        System.out.print("Enter User ID: ");
52        String userId = scanner.nextLine();
53        System.out.print("Enter Password: ");
54        String password = scanner.nextLine();
55
56        // Checking user access
57        if (checkUser(userId, password)) {
58            System.out.println("Access Granted");
59        } else {
60            System.out.println("Access Denied");
61        }
62        scanner.close();
63    }
64}
```

Enter User ID: password123  
Enter Password: mysecurepassword  
Access Denied

## Task 3: PreparedStatement

Modify the SELECT query program to use PreparedStatement to parameterize the query and prevent SQL injection.

### Explanation:

#### 1. Database Connection:

- We define the database URL, username, and password to connect to the database.
- Use `DriverManager.getConnection` to establish the connection.

#### 2. PreparedStatement:

- `PreparedStatement` is used to parameterize the SQL query.
- We use placeholders (`?`) in the SQL query string.
- `pstmt.setString(1, userId)` and `pstmt.setString(2, password)` set the values for the placeholders.

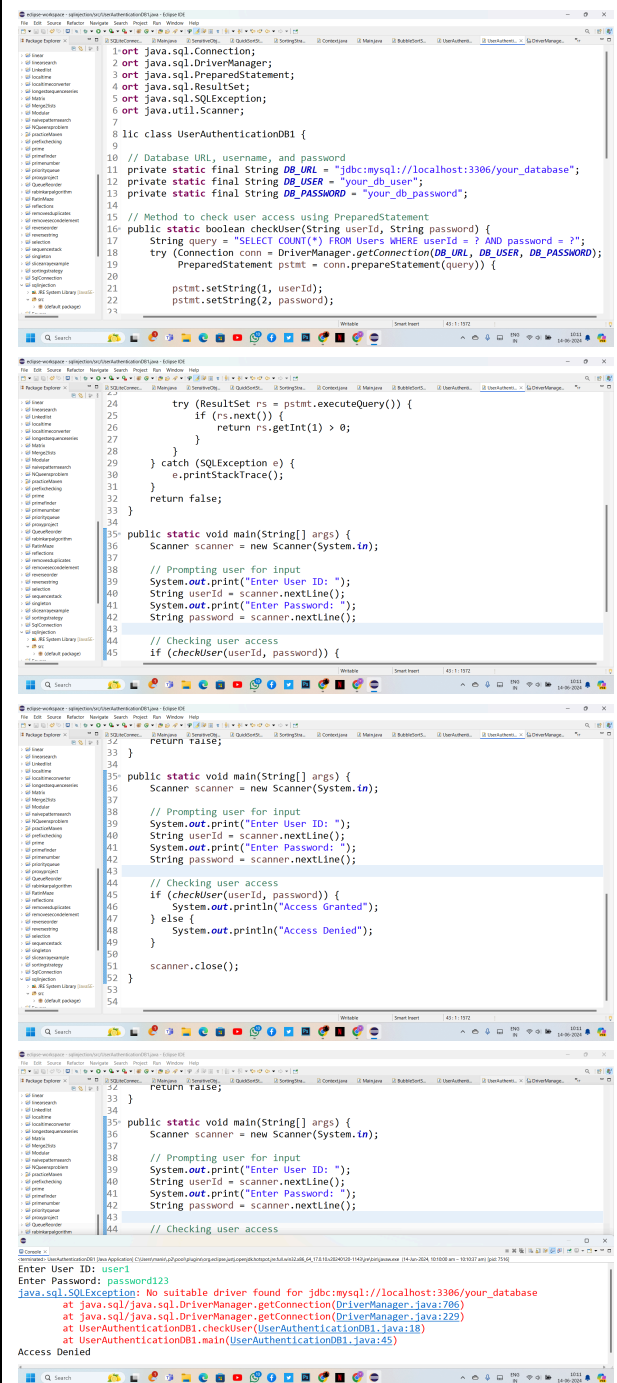
#### 3. Executing the Query:

- `pstmt.executeQuery()` executes the query and returns a `ResultSet`.
- We check if the user exists by checking if the `ResultSet` contains any rows.

#### 4. User Interaction:

- In the `main` method, we prompt the user to enter their user ID and password.
- We call `checkUser` with these inputs to verify the credentials.
- The program prints "Access Granted" if the credentials are correct, otherwise "Access Denied".

This approach ensures that the SQL query is parameterized, which prevents SQL injection attacks by treating user input as data rather than executable SQL code.



```
1: import java.sql.*;
2:
3: import java.sql.DriverManager;
4: import java.sql.PreparedStatement;
5: import java.sql.ResultSet;
6: import java.sql.SQLException;
7: import java.util.Scanner;
8:
9: public class UserAuthenticationDB1 {
10:     // Database URL, username, and password
11:     private static final String DB_URL = "jdbc:mysql://localhost:3306/your_database";
12:     private static final String DB_USER = "your_db_user";
13:     private static final String DB_PASSWORD = "your_db_password";
14:
15:     // Method to check user access using PreparedStatement
16:     public static boolean checkUser(String userId, String password) {
17:         String query = "SELECT COUNT(*) FROM Users WHERE userid = ? AND password = ?";
18:         try (Connection conn = DriverManager.getConnection(DB_URL, DB_USER, DB_PASSWORD);
19:              PreparedStatement pstmt = conn.prepareStatement(query)) {
20:             pstmt.setString(1, userId);
21:             pstmt.setString(2, password);
22:
23:             try (ResultSet rs = pstmt.executeQuery()) {
24:                 if (rs.next()) {
25:                     return rs.getInt(1) > 0;
26:                 }
27:             }
28:         } catch (SQLException e) {
29:             e.printStackTrace();
30:         }
31:         return false;
32:     }
33:
34:     public static void main(String[] args) {
35:         Scanner scanner = new Scanner(System.in);
36:
37:         // Prompting user for input
38:         System.out.print("Enter User ID: ");
39:         String userId = scanner.nextLine();
40:         System.out.print("Enter Password: ");
41:         String password = scanner.nextLine();
42:
43:         // Checking user access
44:         if (checkUser(userId, password)) {
45:             System.out.println("Access Granted");
46:         } else {
47:             System.out.println("Access Denied");
48:         }
49:         scanner.close();
50:     }
51: }
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