

Software Security CCCY 322

Course Project – Phase 2

By Raghad lafe

Static analysis

THE TOOL I USED FOR STATIC ANALYSIS IS {SpotBugs}

The screenshot shows the SpotBugs static analysis tool interface. The main window displays the source code of a Java class named `Project.java`. The code includes a method `saveUserData` that generates a secure key for encryption, creates a cipher object, and encrypts user data. A warning is highlighted in the code editor, indicating a reliance on default encoding in the `String.getBytes()` method call. The right-hand pane shows the bug details, including the bug instance type, rank, confidence, pattern, and XML output. The bottom pane shows a list of warnings, with the same warning repeated for the `Project.java` file.

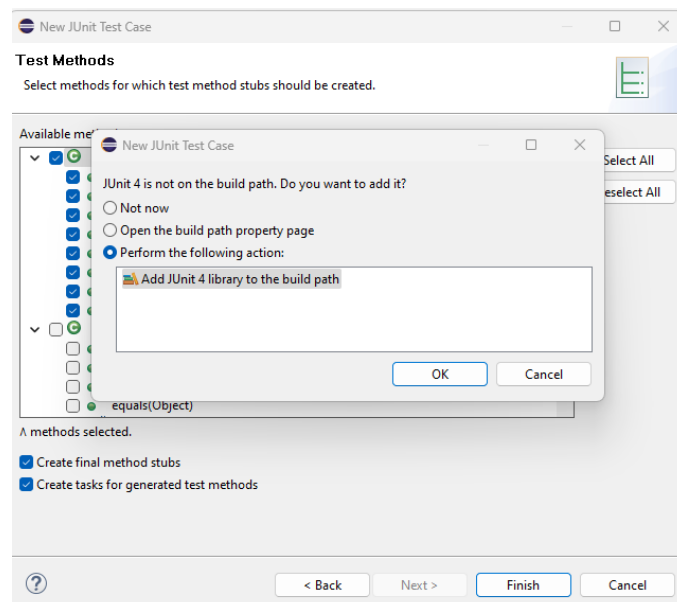
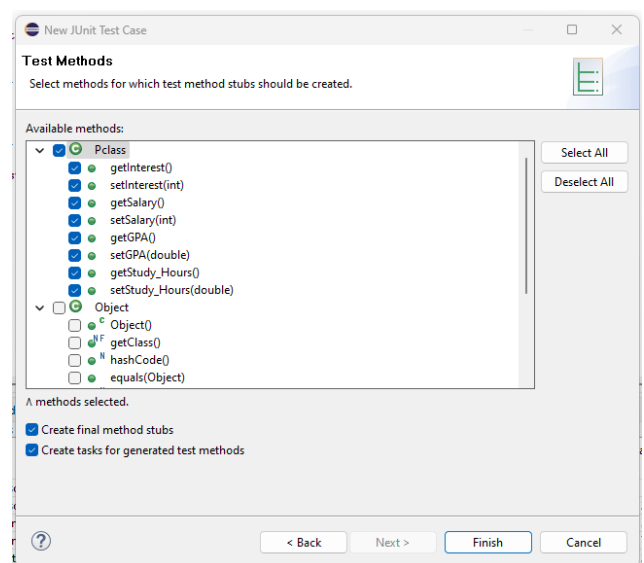
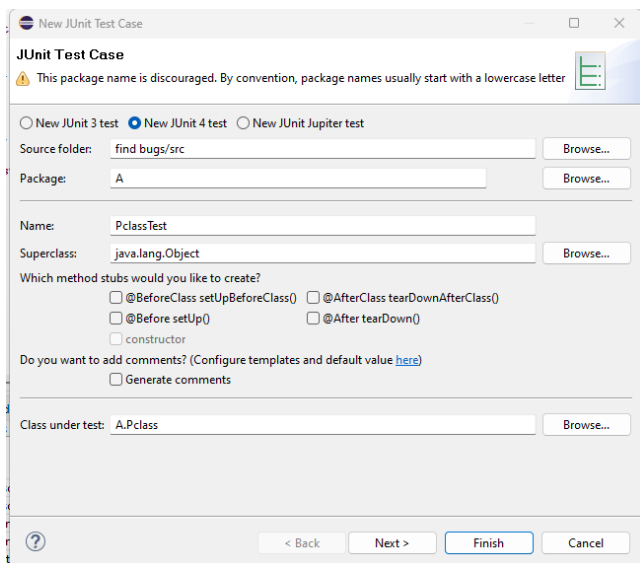
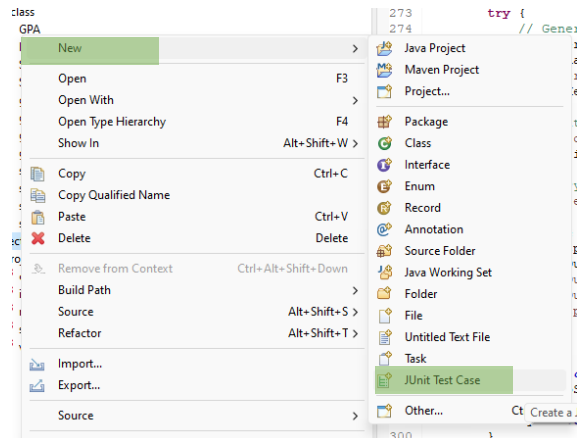
The screenshot shows the SpotBugs static analysis tool interface. The main window displays the source code of a Java class named `Project.java`. The code includes a `main` method that prompts the user for a username and password, and then attempts to log in. A warning is highlighted in the code editor, indicating a reliance on default encoding in the `new java.util.Scanner(InputStream)` method call. The right-hand pane shows the bug details, including the bug instance type, rank, confidence, pattern, and XML output. The bottom pane shows a list of warnings, with the same warning repeated for the `Project.java` file.

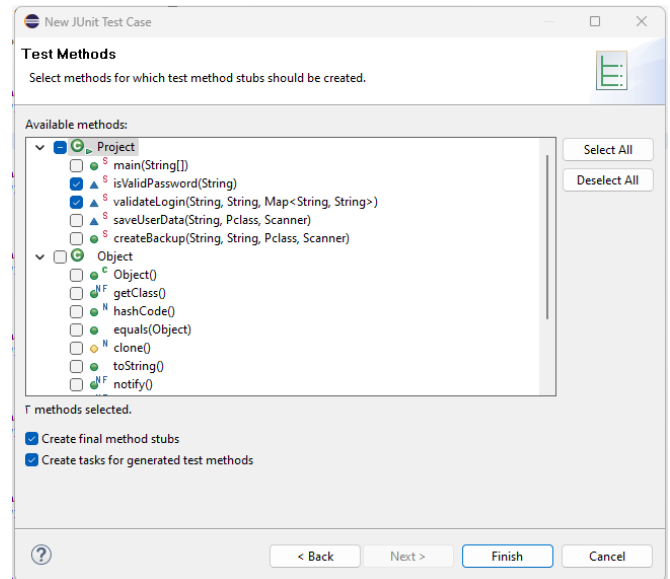
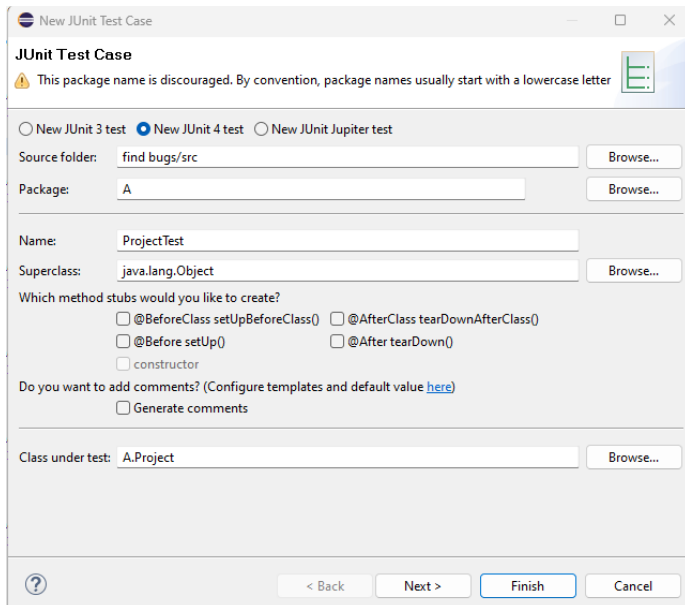
The screenshot shows the SpotBugs static analysis tool interface. The main window displays the source code of a Java class named `Project.java`. The code includes a `createBackup` method that generates a secure key for encryption, creates a cipher object, and encrypts user data. A warning is highlighted in the code editor, indicating a reliance on default encoding in the `String.getBytes()` method call. The right-hand pane shows the bug details, including the bug instance type, rank, confidence, pattern, and XML output. The bottom pane shows a list of warnings, with the same warning repeated for the `Project.java` file.

Dynamic analysis

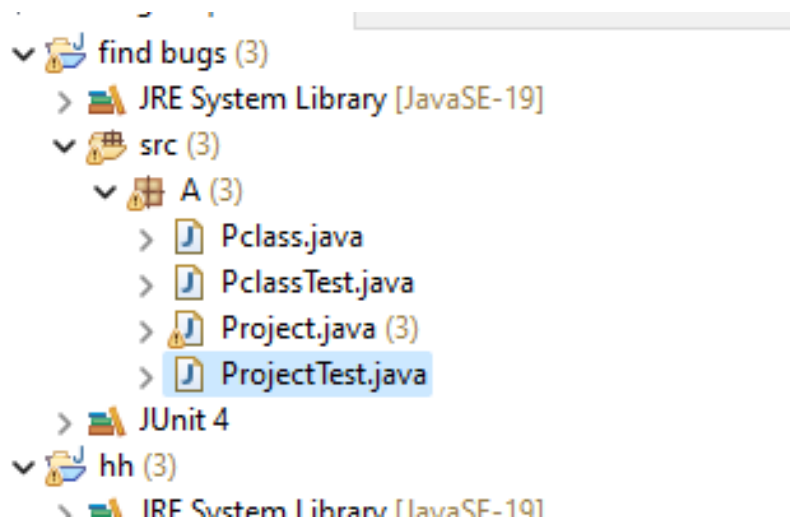
THE TOOL I USED FOR DYNAMIC ANALYSIS IS { EcEmma Coverage Report}

First Lunch JUnit Lib and preform test cases for both classes.

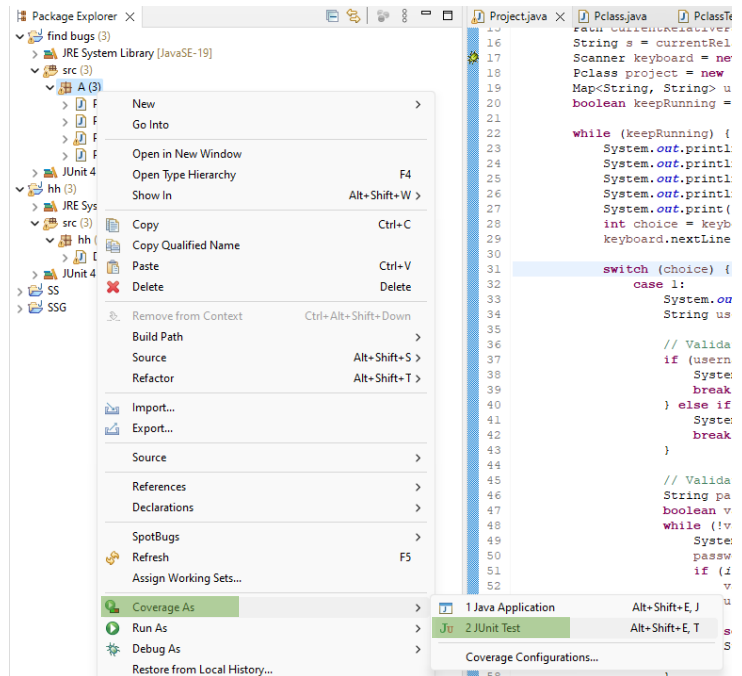
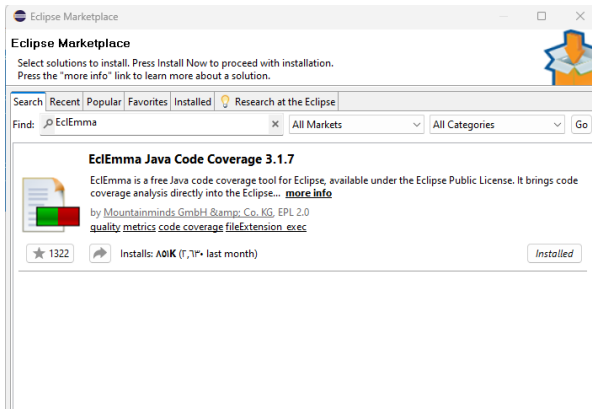




Now we have the Junit test cases for both classes.



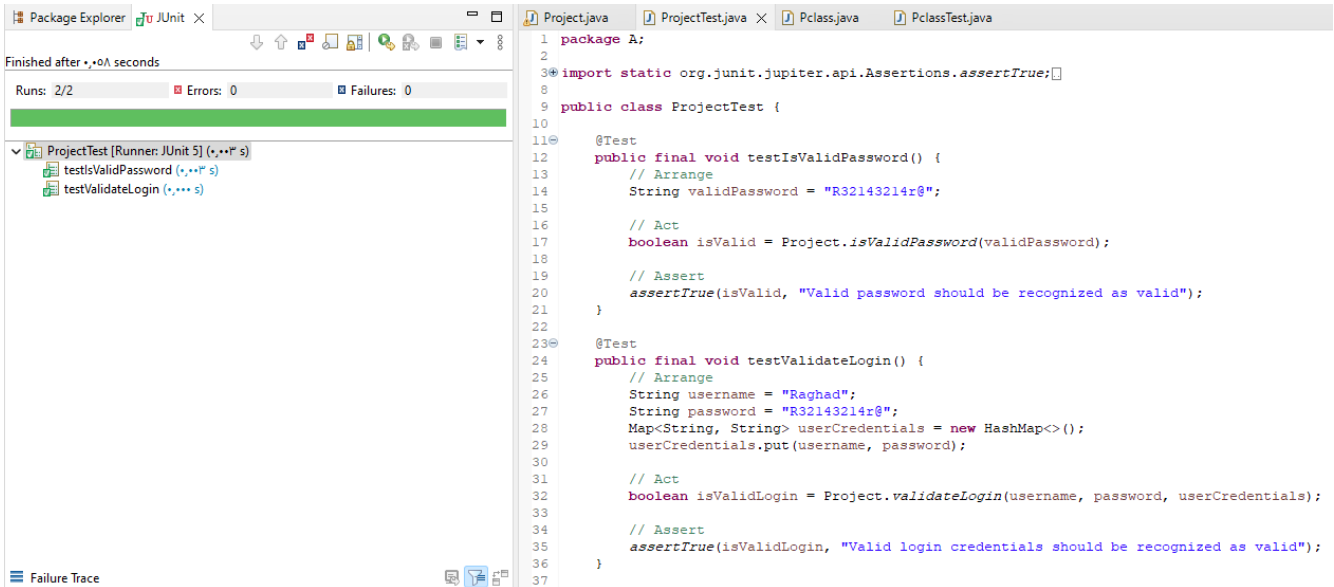
Now install and preform the EclEmma Coverage Report for the whole project



Element	Coverage	Covered Instruction...	Missed Instructions	Total Instructions
find bugs (3)	100%	130	0	130
src (3)	100%	130	0	130
A (3)	100%	130	0	130
Project.java	100%	19	0	19
Project	100%	19	0	19
main(String[])	100%	1	0	1
createBackup(String, String, Pclass, Scanner)	100%	1	0	1
saveUserData(String, Pclass, Scanner)	100%	1	0	1
validateLogin(String, String, Map<String, String>)	100%	1	0	1
isValidPassword(String)	100%	1	0	1
Pclass.java	100%	1	0	1
Pclass	100%	1	0	1
getGPA()	100%	1	0	1
getInterest()	100%	1	0	1
getSalary()	100%	1	0	1
getStudy_Hours()	100%	1	0	1
setGPA(double)	100%	1	0	1
setInterest(int)	100%	1	0	1
setSalary(int)	100%	1	0	1
setStudy_Hours(double)	100%	1	0	1
PclassTest.java	100%	0	0	0
PclassTest	100%	0	0	0
testSetAndGetGPA()	100%	1	0	1
testSetAndGetInterest()	100%	1	0	1
testSetAndGetSalary()	100%	1	0	1
testSetAndGetStudyHours()	100%	1	0	1
ProjectTest.java	100%	3	0	3
ProjectTest	100%	3	0	3
testIsValidPassword()	100%	1	0	1
testValidateLogin()	100%	1	0	1

List of Junit Test Cases

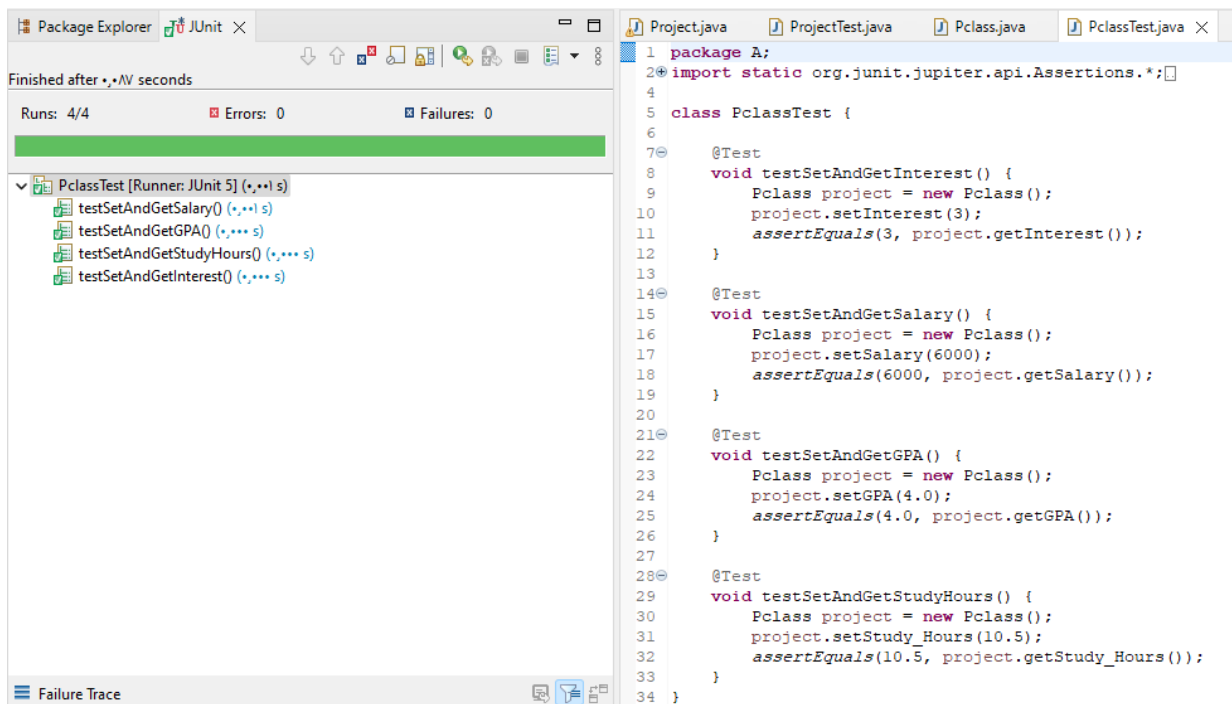
Junit Test Cases for the main class (Project)



The screenshot displays an IDE with the JUnit test results for the `Project` class on the left and the `ProjectTest.java` source code on the right. The test results show two tests passed: `testIsValidPassword` and `testValidateLogin`. The source code for `ProjectTest` is as follows:

```
1 package A;
2
3 import static org.junit.jupiter.api.Assertions.assertTrue;
4
5 public class ProjectTest {
6
7     @Test
8     public final void testIsValidPassword() {
9         // Arrange
10         String validPassword = "R32143214r@";
11
12         // Act
13         boolean isValid = Project.isValidPassword(validPassword);
14
15         // Assert
16         assertTrue(isValid, "Valid password should be recognized as valid");
17     }
18
19     @Test
20     public final void testValidateLogin() {
21         // Arrange
22         String username = "Raghad";
23         String password = "R32143214r@";
24         Map<String, String> userCredentials = new HashMap<>();
25         userCredentials.put(username, password);
26
27         // Act
28         boolean isValidLogin = Project.validateLogin(username, password, userCredentials);
29
30         // Assert
31         assertTrue(isValidLogin, "Valid login credentials should be recognized as valid");
32     }
33 }
```

Junit Test Cases for class (Pclass)



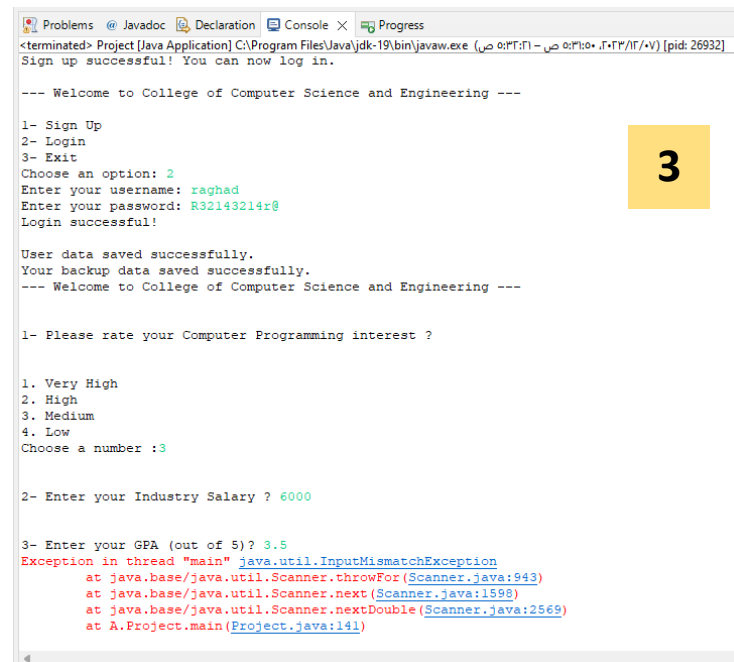
The screenshot displays an IDE with the JUnit test results for the `PclassTest` class on the left and the `PclassTest.java` source code on the right. The test results show four tests passed: `testSetAndGetSalary`, `testSetAndGetGPA`, `testSetAndGetStudyHours`, and `testSetAndGetInterest`. The source code for `PclassTest` is as follows:

```
1 package A;
2 import static org.junit.jupiter.api.Assertions.*;
3
4 class PclassTest {
5
6     @Test
7     void testSetAndGetInterest() {
8         Pclass project = new Pclass();
9         project.setInterest(3);
10         assertEquals(3, project.getInterest());
11     }
12
13     @Test
14     void testSetAndGetSalary() {
15         Pclass project = new Pclass();
16         project.setSalary(6000);
17         assertEquals(6000, project.getSalary());
18     }
19
20     @Test
21     void testSetAndGetGPA() {
22         Pclass project = new Pclass();
23         project.setGPA(4.0);
24         assertEquals(4.0, project.getGPA());
25     }
26
27     @Test
28     void testSetAndGetStudyHours() {
29         Pclass project = new Pclass();
30         project.setStudy_Hours(10.5);
31         assertEquals(10.5, project.getStudy_Hours());
32     }
33 }
```

Black-box test

{Test cases}

	Input	Expected value	Actual value
1	Error guessing Choose (1) Signup Enter valid username Enter valid password Enter an invalid ID	Error message indicating invalid ID	Program displayed the Error message indicating invalid ID
2	Error guessing Choose option (2) Enter a nonexistent username	Login fail, Error message indicating the username doesn't exist	User failed to login and program displayed the Error message indicating the username doesn't exist
3	Functionality testing After successful login Enter interest= Medium (3) Enter salary >=6000 Enter GPA >=3.5	Message indicating Data Analyst category	java.util.InputMismatchException



```

Problems @ Javadoc Declaration Console X Progress
<terminated> Project [Java Application] C:\Program Files\Java\jdk-19\bin\javaw.exe (ص: ٥:٢٢:١١ - ص: ٥:٢٣:٥٠, ٢٠٢٣/١٢/٠٧) [pid: 26932]
Sign up successful! You can now log in.

--- Welcome to College of Computer Science and Engineering ---

1- Sign Up
2- Login
3- Exit
Choose an option: 2
Enter your username: raghad
Enter your password: R32143214r@
Login successful!

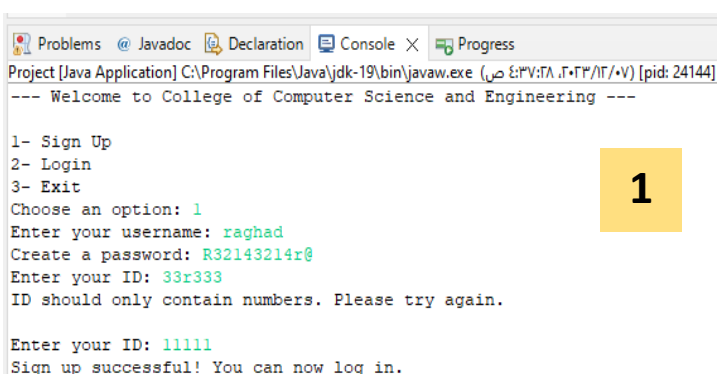
User data saved successfully.
Your backup data saved successfully.
--- Welcome to College of Computer Science and Engineering ---

1- Please rate your Computer Programming interest ?

1. Very High
2. High
3. Medium
4. Low
Choose a number : 3

2- Enter your Industry Salary ? 6000

3- Enter your GPA (out of 5)? 3.5
Exception in thread "main" java.util.InputMismatchException
    at java.base/java.util.Scanner.throwFor(Scanner.java:943)
    at java.base/java.util.Scanner.next(Scanner.java:1598)
    at java.base/java.util.Scanner.nextDouble(Scanner.java:2569)
    at A.Project.main(Project.java:141)
  
```

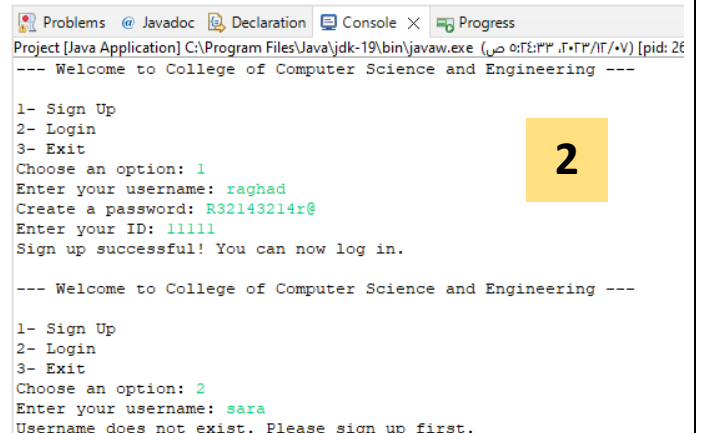


```

Problems @ Javadoc Declaration Console X Progress
Project [Java Application] C:\Program Files\Java\jdk-19\bin\javaw.exe (ص: ٤:٣٧:٢٨ - ص: ٤:٣٧:٢٨, ٢٠٢٣/١٢/٠٧) [pid: 24144]
--- Welcome to College of Computer Science and Engineering ---

1- Sign Up
2- Login
3- Exit
Choose an option: 1
Enter your username: raghad
Create a password: R32143214r@
Enter your ID: 33r333
ID should only contain numbers. Please try again.

Enter your ID: 11111
Sign up successful! You can now log in.
  
```



```

Problems @ Javadoc Declaration Console X Progress
Project [Java Application] C:\Program Files\Java\jdk-19\bin\javaw.exe (ص: ٥:٢٤:٣٣ - ص: ٥:٢٤:٣٣, ٢٠٢٣/١٢/٠٧) [pid: 26932]
--- Welcome to College of Computer Science and Engineering ---

1- Sign Up
2- Login
3- Exit
Choose an option: 1
Enter your username: raghad
Create a password: R32143214r@
Enter your ID: 11111
Sign up successful! You can now log in.

--- Welcome to College of Computer Science and Engineering ---

1- Sign Up
2- Login
3- Exit
Choose an option: 2
Enter your username: sara
Username does not exist. Please sign up first.
  
```

White-box test

{Test cases}

	scenario	Input	Expected value	Actual value
1	Testing Input Validation Loop for Interest.	Set interest = 1 (valid value)	The loop should not execute, and project.setInterest(interest) should be called.	project.setInterest(interest) called and the loop is still executing.
2	Testing the conditions	Set Interest (1) Set Salary (7000) Set GPA (4.0)	message should print indicating that the user's input does not meet the specified criteria. "Your input not in the range. Please try again."	The message did print. "Your input not in the range. Please try again."
3	Testing the conditions	Set Interest (3) Set Salary (7000) Set GPA (4.0)	Display the suitable program for user which is (Network Engineer) & (Software Developer)	Program displayed the suitable program for user which is (Network Engineer) & (Software Developer)

```

Problems @ Javadoc Declaration Console X Progress
Project [Java Application] C:\Program Files\Java\jdk-19\bin\javaw.exe (pid: 29580)
2- Login
3- Exit
Choose an option: 2
Enter your username: r
Enter your password: R32143214r@
Login successful!

User data saved successfully.
Your backup data saved successfully.
--- Welcome to College of Computer Science and Engineering ---

1- Please rate your Computer Programming interest ?

1. Very High
2. High
3. Medium
4. Low
Choose a number :1
2- Enter your Industry Salary ? 7000
3- Enter your GPA (out of 5)? 4

-Industry job category: Cybersecurity Engineering
Required acceptable GPA in industry: 4
Required study time: 4.0

Your input not in the range. Please try again.

--- Welcome to College of Computer Science and Engineering ---
  
```

1

2

```

Project [Java Application] C:\Program Files\Java\jdk-19\bin\javaw.exe (pid: 29580)
--- Welcome to College of Computer Science and Engineering ---

1- Please rate your Computer Programming interest ?

1. Very High
2. High
3. Medium
4. Low
Choose a number :2
2- Enter your Industry Salary ? 8000
3- Enter your GPA (out of 5)? 4

-Industry job category: Software Developer
Required acceptable GPA in industry: 3.5
Required study time: 4.0

-Industry job category: Network Engineer
Required acceptable GPA in industry: 3.5
Required study time: 4.0
  
```

3