

# Lab Guide

## Lab Exercises

### Chapter 02

#### Exercise 1

John needs to write a program to calculate the total distance travelled by a vehicle. To calculate the distance, John can use the following formula:

$$\text{Distance} = ut + (at^2) / 2$$

Here,  $u$  is the initial velocity (meters per second),  $a$  is the acceleration (meters per second<sup>2</sup>), and  $t$  is the time (seconds). Help John to perform the desired task.



#### Exercise 2

Mary needs to write a program to calculate the volume of a cylinder. To calculate the volume, Mary needs to use the following formula:

$$\text{Volume} = \pi r^2 h$$

Here,  $r$  is the radius of the cylinder,  $h$  is the height of the cylinder, and the value of  $\pi$  (n) is 3.14. Help Mary to perform the desired task.



#### Exercise 3

Arnold wants to write a program to convert the temperature from Celsius to Fahrenheit. To calculate the temperature, Arnold can use the following formula:

$$F = C * 9/5 + 32$$

Here,  $c$  is the temperature in Celsius and  $f$  is the temperature in Fahrenheit. Help Arnold to perform the desired task.



#### Exercise 4

Write a program to find out the number of illiterate men from the population of 80,000 people. From the total population, 52% are men, out of which only 35% are literate.



#### Exercise 5

Write a program to display the postfix and prefix values of the number, 5, by using increment operators.



#### Exercise 6

Write a program to create a class named `EmployeeDetails` and display a menu similar to the following menu:

```
-----Menu-----  
1. Enter Data  
2. Display Data  
3. Exit  
Choose the option:
```

Thereafter, invoke the respective method according to the given menu input. The methods will contain appropriate messages, such as the `displayData()` method will contain the message, `displayData method is invoked`.



#### Exercise 7

Write a program to create a class that declares a member variable and a member method. The member method will display the value of the member variable.



#### Exercise 8

Write a program to create a class that stores the train reservation details. In addition, define a method that will display the stored details.



#### Exercise 9

Write a program to create a class that stores the grocery details. In addition, define three methods that will add the weight, remove the weight, and display the current weight, respectively.



### Exercise 10

Write a program to display the following numeric pattern:

```
12345
1234
123
12
1
```



### Exercise 11

Write a program to identify whether the given character is a vowel or a consonant.



### Exercise 12

Write a program to display all the prime numbers from 1 to 20.



### Exercise 13

Write a program to check if the first number is divisible by the second number or not. In addition, display appropriate messages according to the result.



### Exercise 14

Write a program to print the table of five.



### Exercise 15

Write a program that will store the employee records, such as employee ID, employee name, department, designation, date of joining, date of birth, and marital status, in an array. In addition, the stored record needs to be displayed.



### Exercise 1

Write a program that stores the details of the Software and Hardware books. The Software book includes the software version and software name. The Hardware book includes the hardware category and publisher. However, both the books include some common details, such as author name, title, price, and number of pages. Therefore, you need to store and display the book details by implementing the code reusability in the program.



### Exercise 2

Write a program to demonstrate the polymorphism concept by overloading the add method that allows addition of the following numbers:

- Two integer numbers
- Two fractional numbers
- Three integer numbers



## Chapter 04

### Exercise 1

Write a program to store the employee details, such as employee ID, name, designation, and department. In addition, the employee details should be displayed when the object of the class is printed.



### Exercise 2

Write a program that stores the details of students and employees. The student details include first name, last name, age, course enrolled, and student ID. The employee details include first name, last name, age, salary, department name, designation, and employee ID. You need to implement the preceding functionalities by ensuring the reusability of code.



### Exercise 3

Write a program to create a class that will store the length and breadth of the rectangle. In addition, you need to check whether two objects of the class contain the same values or not.



## Chapter 05

### Exercise 1

Furniture and Fittings Company (FFC) manufactures several furniture items, such as chairs and bookshelves. The furniture items in the company have some common characteristics, such as price, width, and height. However, some furniture items have some specific details. For example, a bookshelf has a number of shelves. Now, write a Java program that uses the concept of abstract class to store and display the details of furniture items.



### Exercise 2

Write a program to calculate the area of triangle, circle, square, and rectangle. However, you need to ensure that the preceding set of functionalities must be achieved by implementing abstraction.



### Exercise 3

Mark has been assigned a task of developing a game console. In this game console, he needs to ensure that the following functionalities are implemented:

- Each game in the game console must offer functionalities, such as play game, compute score, and display score.
- The display score functionality will remain the same for all the games. However, the play game and compute score functionalities will be different for each game.

In the initial phase, you do not need to implement the logic of the functionalities. However, display appropriate messages, such as the play game functionality will display the message, *starting the game*. Now, help Mark to achieve the preceding requirements.



### Exercise 4

Write a program to create a class that contains a method that accepts compass directions and displays the same. In addition, you need to ensure that the method must accept any one of the directions: NORTH, SOUTH, EAST, WEST, NORTHEAST, SOUTHEAST, SOUTHWEST, or NORTHWEST.



### Exercise 5

Write a program to display the number of objects created for a class.



## Chapter 07

### Exercise 1

Kiwi Inc. is a leading software development company in the US. The top management of the organization has found that the Help Desk division does not handle queries or issues of the employees on a priority basis. For this, the top management has decided to automate the tasks of the Help Desk division. Therefore, the management has assigned this task to the development team to create an application that has the following functionalities:

- Application must enable employees to log their requests or issues.
- Application must enable the team of the Help Desk division to handle queries on the first come first served basis.

The development team has assigned the task to John, the Senior Software Developer. However, in the initial phase of development, John needs to create the user interface and create the application only for a single user. Help John to achieve the preceding requirements.



### Exercise 2

Write a program to store the student details, such as name and marks. In addition, you need to implement the functionality that helps in sorting the details according to name and marks, separately. For this, you need to implement two different logics. One will sort the details according to the name in ascending order, and the other will sort the details according to the marks in ascending order.



### Exercise 3

Write a program to store the details of football team players, such as name, age, number of matches played, ranking, and number of goals made. For this, you need to store the details of 15 players, which include goal-keeper and extras. In addition, you need to create three separate lists of 11 players for the triangular tournament. Moreover, you need to arrange players according to their ranking in the respective lists.



## Chapter 08

### Exercise 1

Write a program to accept a three letter word as an input from the user and display the message, Expression Matched, if the word starts with the letter, “a”, “b”, or “c”, and ends with, “at”.



### Exercise 2

Write a program to accept the date from the user and validate it according to the format, DD/MM/YYYY or D/M/YYYY. In addition, the year should be from 1900 to 2099.



### Exercise 3

Write a program that accepts the URL of the Web portal from the user, such as `http://www.xyz.com`, `www.xyz.com`, or `ftp://xyz.com`, and validate the format of the URL with the following fields:

- Protocol, such as `https` or `http`
- Domain, such as `google` or `yahoo`
- Top level domain, such as `.co` or `.com`



### Exercise 4

You need to develop an application that accepts name and contact number as inputs from the user. In addition, you need to validate these inputs based on the following constraints:

- The name should contain only letters.
- The contact number should contain only numeric values in the `(xx-xxxx-xxxx)` format.



### Exercise 5

Write a Java program to find out the total number of alphabets and digits in a given string.



### Exercise 6

Create a console based login form, which will accept the email id and password from the user. When a user enters the email id and password, it should be validated. The email id field should be specified in the format, such as `xyz@xyz.co.in` or `xyz@xyz.com`. In addition, the format of the password should adhere to the following conventions:

- There should be one special character, such as `@`, `#`, `$`, `%`.
- There should be one uppercase letter.
- There should be one lowercase letter.
- The password should be eight characters long.



## Exercise 7

Write a program to accept a 12 hour clock time from the user. In addition, you need to validate, if the user has entered an appropriate time according to the following constraints:

- Hours and minutes must be separated by colon (:).
- The time will end with am or pm.
- The time should be specified in the format, such as “1:00am”, “1:00 am”, and “1:00 AM”.
- The time cannot be 00:00.



## Chapter 09

### Exercise 1

David has been assigned a task of creating an application to store the employee details. For this, David decides to display the following menu when the application starts:

1. Enter Data
2. Display Data
3. Exit

Thereafter, he decides to implement the following functionalities:

- When a user selects the option to enter data, the employee details, such as employee ID, employee name, department, designation, date of joining, date of birth, marital status, and date of marriage, should be captured. However, the date of marriage can be captured only if the employee is married. In addition, a functionality to add more records should be implemented.
- When a user selects the option to display the data, the stored data must be displayed.
- When a user selects the option to exit, the application must be terminated.

Further, David needs to implement user-defined exceptions for the following cases:

- If the menu input entered by the user is other than 1, 2, or 3, an appropriate message should be displayed to the user and the application must restart.
- If the employee ID does not start with the alphabet, e or E, an appropriate message should be displayed to the user and the application must terminate.

Help David to implement the preceding functionalities.



### Exercise 2

You need to write a program to register the member details to get an entry ticket of a disco. The program should accept the member details, such as name, contact number, and age. In addition, the program must throw an exception with an appropriate message if the age is not within the range of 18 to 55.



### Exercise 3

Create a calculator application in Java that will accept two numbers. In addition, the calculator application should allow a user to perform any of the following operations at a time on the two given numbers:



- Addition
- Subtraction
- Multiplication
- Division

Further, you need to implement assertions to assert that both the numbers should be greater than 0.



#### Exercise 4

Write a program to accept two numbers and perform division. In addition, the program should provide the functionality such that if a user tries to divide the number by 0, the program should terminate with a customized message.



## Chapter 10

#### Exercise 1

Write a program to create a class to handle the enquiry details related to tourism. The class should provide the following functionalities:

- A menu should be displayed that allows the user to initiate enquiry, view enquiry, and exit the menu.
- If the option to initiate enquiry is selected, the program should allow the user to enter the enquiry details, such as name, contact number, address, enquiry category, and description of the enquiry. In addition, the enquiry categories will be Prices, Locations, and Packages. Further, the entered details should be stored in the **Enquiry.txt** file.
- If the option to view query details is selected, the name of the user, whose details need to be viewed, should be entered. If the name exists in the **Enquiry.txt** file, the details should be displayed. Otherwise, an error message should be displayed.
- If the option to exit the menu is selected, the program must terminate.



#### Exercise 2

James is employed as a Software Developer at AxisPro Technologies. He has been assigned the task to create the Fill in the Blanks game for kids. The menu of the game should provide the following options:

1. Play
2. Instructions
3. Quit

Thereafter, James needs to implement the following functionalities:

- On selecting the Play option:
  - Enter details:
    - The player needs to enter his/ her name to start the game.
  - Select Category:
    - A list of categories, such as countries, fruits, and animals, should be displayed to the player. From the listed categories, the user needs to enter the name of the category from which he/ she wants to get the words.
  - Guess alphabet:
    - After selecting the category, a word from the respective category should be picked and the blanks for that word should be displayed, such as for TIGER, it should display \_\_\_\_.
    - The player will have to correctly guess an alphabet for each of the blanks.
    - After guessing the correct word, the congratulation message should be displayed. In addition, blanks for the next word should be displayed till the list gets finished.
    - If the player guesses the alphabet incorrectly, that alphabet must be added in the list of missed words.
    - The player is allowed only the length of the word/2 incorrect guess.
  - Calculate Score:
    - Score, such as 10 or 20, should be given to the player on guessing a correct word.
    - An appropriate message with the score should be displayed when the player guesses all the words correctly and when the game gets over.
    - Scores with the name of the player in the **Score.txt** file must be stored or updated.
  - Create Files:
    - Create a **Master.txt** file that will contain the list of categories.
    - Create a separate file for each category, such as for animals, create **Animal.txt**, and for fruits, create **Fruit.txt**.
- On selecting the Instructions option, the instructions of the game should be displayed.
- On selecting the Quit option, the game must terminate.

Help James to implement the preceding functionalities.



### Exercise 3

Write a Java program to perform the following tasks:

- Reading a text file
- Writing in a text file
- Searching in a text file



### Exercise 4

Write a program to create a bank application that provides the basic functionalities to operate the savings account. The application should provide the following functionalities:

- A menu should be displayed that will allow the user to open a new account, deposit money, withdraw money, check balance, and exit.
- If the open a new account option is selected, the program should prompt the user to enter the basic details, such as name, contact number, address, and opening amount. Further, it must generate an account number and allocate that number to the new account. In addition, the user details along with the account number must be saved in the **Saving\_Account.txt** file; and a separate file for the new account with the account number as the name of the file must be created.
- If the deposit money, withdraw money, or check balance option is selected, the program should ask for the account number from the user. Thereafter, it should validate the account number, and on the basis of the valid account number, it should execute the following functionalities:
  - Deposit money option:
    - The program should ask the user to enter the deposit amount. In addition, it should update the transaction and the balance in the respective file of the account holder.
  - Withdraw money option:
    - The program should ask the user to enter the amount to withdraw. In addition, it should update the transaction and the balance in the respective file of the account holder.

- Check balance:
  - It should display the current balance.
- If the exit option is selected, the application must terminate.



## Chapter 11

### Exercise 1

Write a Java program to obtain a list and count of filenames that match a pattern, such as \*.java.



### Exercise 2

Write a Java program to traverse each and every file present within the specified directory and display its status in the following pattern:

```
About to visit D:\Test
About to visit D:\Test\Hello
Just Visited D:\Test\Hello
Currently visiting D:\Test\Hello.txt
Is this file a directory: false
Checking done...!!
Just Visited D:\NIO
```



### Exercise 3

Write a Java program to monitor and generate events for the activities, such as creating, deleting, and modifying a file, in the specified directory.



### Exercise 4

Steve is a programmer at Global Systems Inc. He has been assigned a task to create a Java application that stores the following details about the computer products in a text file:

- Product ID
- Product name
- Product price

In the preceding list, Product ID and Product name should accept a string value. Product price should accept an integer value.

In addition, the application should store the following details about the shops that sell those products:

- Shop ID
- Shop name
- Address

In the preceding list, Shop ID should accept an integer value. Shop name and Address should accept a string value. Moreover, you need to achieve the preceding requirement by using the NIO features.

As the details are added, they must be appended in the **ProductDetails.txt** file located in the **D:\Details** directory. Further, you need to maintain the most recent copy of the preceding file in the **D:\Backup** directory to ensure a backup.

**Prerequisite:** To perform this exercise, you need to ensure that the **Details** and **Backup** folders exist in the **D** drive. If the folders do not exist, you need to create the required folders inside the **D** drive.



## Chapter 12

### Exercise 1

Write a Java program that creates three threads. All three threads should get executed simultaneously and should display the values between 0 and 6. Moreover, you need to ensure that the main thread must be terminated when the execution of the all other threads gets completed. In addition, the output should be displayed in the following format:

```
Thread created: Thread[ChildThread,3,main]
Thread created: Thread[ChildThread,7,main]
Thread created: Thread[ChildThread,8,main]
Main thread waiting for child thread to finish
Thread[ChildThread,3,main]loop :1
Thread[ChildThread,7,main]loop :1
Thread[ChildThread,8,main]loop :1
Thread[ChildThread,8,main]loop :2
Thread[ChildThread,7,main]loop :2
Thread[ChildThread,3,main]loop :2
Thread[ChildThread,7,main]loop :3
Thread[ChildThread,3,main]loop :3
Thread[ChildThread,8,main]loop :3
Thread[ChildThread,3,main]loop :4
Thread[ChildThread,7,main]loop :4
Thread[ChildThread,8,main]loop :4
Thread[ChildThread,7,main]loop :5
Thread[ChildThread,3,main]loop :5
Thread[ChildThread,8,main]loop :5
```

```
Thread[ChildThread,3,]is alive ? : false
Thread[ChildThread,7,]is alive ? : false
Thread[ChildThread,8,]is alive ? : false
Main Thread is exiting
```



## Exercise 2

Write a Java program to simulate the table tennis game. The game should be played in a synchronized manner by two players. When the two players are ready, an appropriate message should be displayed. When the game starts, the output should be displayed in the following format:

```
Player 1 ready...
Player 2 ready...
Ping-
-Pong
```



## Chapter 13

### Exercise 1

Create a Java program that creates two runnable tasks, Display 1 to 10 and Display 11 to 20. The Display 1 to 10 task should print the numbers in the range of 1 to 10 inside a loop. The task, Display 11 to 20, should print the numbers in the range of 11 to 20 inside a loop. Implement the preceding tasks by using an executor service. Ensure that the executor service is shutdown.



## Chapter 14

### Exercise 1

Peter needs to create an application that will enable the staff of City Library to update the details of the publishers according to their ID. For this, the application should allow the staff member to select the field and update the value of the field. Help Peter to achieve the preceding requirement.

**Prerequisite:** To perform this exercise, you need to ensure that the Publisher table with appropriate values exists in the Library database. If the database and the table with appropriate values do not exist, you need to create the Library database, and then execute scripts in the `Create_Publisher.txt` and `Insert_Publisher.txt` files. Ask your faculty to provide you the preceding files.



## Chapter 15

### Exercise 1

Sam needs to write a program to localize the date according to the locale, such as France and US. This program should provide the following functionalities:

- A menu should be displayed to the user that allows the selection of the locale.
- On the basis of the locale selected by the user, the date should be localized and displayed to the user.



### Exercise 2

Peter needs to write a program to localize the currency according to the locale, such as France and US. The program should provide the following functionalities:

- A menu should be displayed to the user that allows the selection of the locale.
- On the basis of the locale selected by the user, the currency should be localized and displayed to the user.

