EAST WEST UNIVERSITY
Department of Computer Science and Engineering
B.Sc. in Computer Science and Engineering Program
CSE110: Object Oriented Programming

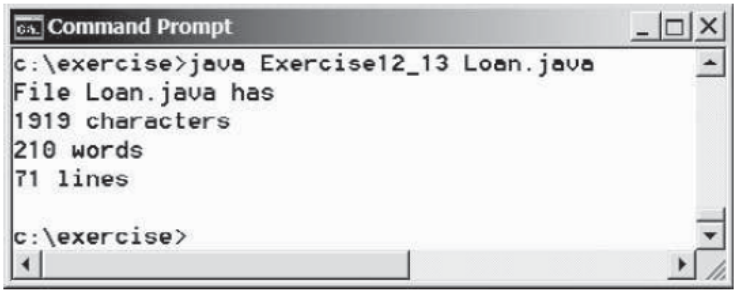
Assignment : **04**
Instructor : **Ahmed Abdal Shafi Rasel, Lecturer, Department of CSE**
Section : **10,11**
Trimester : **Fall 2024**

Objective: The objective of this assignment is to develop problem-solving skills relating to exception handling, file, text I/O, generics, multithreading, and networking.

Tasks:

No.	Problems on Exception Handling
1.	Write a program that creates a simple calculator with an exception handler that deals with nonnumeric operands. Your program should display a message that informs the user of the wrong operand type before exiting.
2.	Write a program that meets the following requirements: i. Creates an array with 100 randomly chosen integers. ii. Prompts the user to enter the index of the array, then displays the corresponding element value. If the specified index is out of bounds, display the message Out of Bounds.
3.	Create a **Triangle** class that defines a triangle using three sides. In a triangle, the sum of any two sides is greater than the other side. The Triangle class must adhere to this rule. Create the **IllegalTriangleException** class, and modify the constructor of the **Triangle** class to throw an **IllegalTriangleException** object if a triangle is created with sides that violate the rule.
4.	Write the ***bin2Dec(String binaryString)*** method to convert a binary string into a decimal number. Implement the ***bin2Dec*** method to throw a **NumberFormatException** if the string is not a binary string.

	Problems on File
1.	Write a program that removes all the occurrences of a specified string from a text file. For example, invoking ***java Exercise12_11 John filename*** removes the string John from the specified file. Your program should get the arguments from the command line.

2.	Write a program that will count the number of characters, words, and lines in a file. Words are separated by whitespace characters. The file name should be passed as a command-line argument, as shown in the following Figure. 
3.	Write a program that counts the number of words in President Abraham Lincoln's Gettysburg address from http://cs.armstrong.edu/liang/data/Lincoln.txt.
4.	Suppose that a text file contains an unspecified number of scores separated by blanks. Write a program that prompts the user to enter the file, reads the scores from the file, and displays their total and average.
5.	Write a program that prompts the user to enter a file name and displays the occurrences of each letter in the file. Letters are case-insensitive. Here is a sample run: Enter a filename: Lincoln.txt Number of A's: 56 Number of B's: 134 ... Number of Z's: 9

No.	Problems On Generics
1.	Write the following method that returns a new **ArrayList**. The new list contains the non-duplicate elements from the original list. ***public static <E> ArrayList<E> removeDuplicates(ArrayList<E> list)***
2.	(Generic linear search) Implement the following generic method for linear search. ***public static <E extends Comparable<E>> int linearSearch(E[] list, E key)***

3.	(Maximum element in an array) Implement the following method that returns the maximum element in an array. ***public static <E extends Comparable<E>> E max(E[] list)***
4.	(Largest element in ArrayList) Write the following method that returns the largest element in an ArrayList: ***public static <E extends Comparable<E>> E max(ArrayList<E> list)***
5.	(Sort ArrayList) Write the following method that sorts an ArrayList: ***public static <E extends Comparable<E>> void sort(ArrayList<E> list)***

No.	Problems On Multithreading
1.	Write a program that launches 1,000 threads. Each thread adds 1 to a variable sum that initially is 0. Define an Integer wrapper object to hold sum. Run the program with and without synchronization to see its effect.
2.	Suppose that you have a bKash account, and it is credited by three agents at the same time with respectively 5000, 2000, and 1000 BDT. But you received only 1000 instead of 8000 in total. Now write a Java program to resolve this issue.
3.	Write down Java program for synchronized Consumer-Producer problem. Suppose the producer here produces characters one after another and puts them in a buffer. The consumer reads and removes the characters from the buffer one at a time.
4.	Consider that you have two separate tasks for depositing to and withdrawing from a random amount within (1-1000 BDT) each time from a bank account, and both tasks are running concurrently. Write a program that ensures that the race condition doesn't occur.

No.	Problems On Networking
1.	Consider the scenario where a server will accept messages from a single client. However, due to heavy load, this server will only echo back the length of the message to the client and does not respond to the client if the client sends the same message twice consecutively. Here, the

	client always initiates communication. Now write a Java code for both the server and client side considering these constraints.
2.	Write a server for a client. The client sends loan information (annual interest rate, number of years, and loan amount) to the server. The server computes monthly payments and total payments and sends them back to the client.
3.	Write a server for a client. The client sends the weight and height of a person to the server. The server computes BMI (Body Mass Index) and sends back to the client a string that reports the BMI.
4.	Create three programs, two of which are clients to a single server. Client1 will send a character to the server process. The server will decrement the letter to the next letter in the alphabet and send the result to client2. Client2 prints the letter it receives, and then all the processes terminate. Next, Client 1 will send a random number to the server. The server will check if the number is odd or even and send the result to the client. Client2 will print the next odd/even number it receives, and then all the processes will terminate.