Assignment 3

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1. Explain all the loops in Java (Explanation, syntax, example program).
→
Loops in Java
In Java, loops are fundamental constructs that allow the execution of a block of code multiple times. There are three primary types of loops: for, while, and do-while. Each loop serves different use cases based on the requirements of the iteration.

1. For Loop

The for loop is typically used when the number of iterations is known beforehand. It consists of three main components: initialization, condition, and increment/decrement.

Syntax

```
for (initialization; termination condition; increment/decrement) {
  // Set of statements to be executed repeatedly
}
```

Example

```
class ForLoopDemo {
  public static void main(String[] args) {
    for (int i = 1; i <= 10; i++) {
      if (i % 2 == 0) {
        System.out.println(i);
      }
    }
    System.out.println("Loop Ending");
  }
}
```

```
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& javac ForLoopDemo.java && java ForLoopDemo
2
4
6
8
10
Loop Ending
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```

2. While Loop

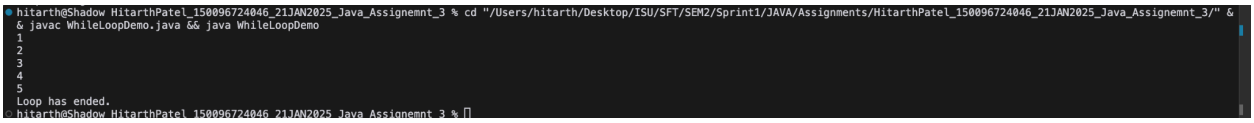
The while loop is used when the number of iterations is not known in advance and depends on a condition that may change during execution. The loop continues as long as the specified condition evaluates to true.

Syntax

```
while (condition) {
  // Set of statements to be executed repeatedly
}
```

Example

```
class WhileLoopDemo {
  public static void main(String[] args) {
     int i = 1;
     while (i <= 5) {
        System.out.println(i);
        i++;
     }
     System.out.println("Loop has ended.");
  }
}
```



3. Do-While Loop

The do-while loop is similar to the while loop but guarantees that the block of code will execute at least once before checking the condition.

Syntax

```
do {
  // Set of statements to be executed repeatedly
```

```
} while (condition);
```

Example

```
class DoWhileLoopDemo {
  public static void main(String[] args) {
    int i = 1;
    do {
      System.out.println(i);
      i++;
    } while (i <= 5);
    System.out.println("Loop has ended.");
  }
}
```

2. Explain arrays in Java (1D array: syntax, initialization, example, 2D array:syntax, initialization, example, Jagged array: syntax, initialization, example).

→

Arrays in Java

Arrays in Java are data structures that allow you to store multiple values of the same type in a single variable. They provide a way to group related data together, making it easier to manage and manipulate. Java supports one-dimensional arrays, multi-dimensional arrays (like two-dimensional arrays), and jagged arrays.

1. One-Dimensional Array

A one-dimensional array is a linear data structure that holds a fixed number of values of the same type.

Syntax

```
dataType arrayName[] = {value1, value2, ..., valueN};
```

Initialization

You can initialize a one-dimensional array either by specifying its size or by directly providing the values.

Example

```java
class OneDimensionalArrayExample {
  public static void main(String[] args) {
    int[] numbers = new int[5];

    int[] predefinedNumbers = {10, 20, 30, 40, 50};

    for (int i = 0; i < numbers.length; i++) {
      numbers[i] = (i + 1) * 10;
    }

    System.out.println("Numbers:");
    for (int num : numbers) {
      System.out.print(num + " ");
    }

    System.out.println("\nPredefined Numbers:");
    for (int num : predefinedNumbers) {
      System.out.print(num + " ");
    }
  }
}
```

```
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& javac OneDimensionalArrayExample.java && java OneDimensionalArrayExample
Numbers:
10 20 30 40 50
Predefined Numbers:
10 20 30 40 50
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```

2. Two-Dimensional Array

A two-dimensional array is essentially an array of arrays, allowing you to create a matrix-like structure.

Syntax

```
dataType arrayName[][] = {{value1, value2}, {value3, value4}, ...};
```

Initialization

You can initialize a two-dimensional array by specifying the number of rows and columns or by directly providing the values.

Example

```
class TwoDimensionalArrayExample {
  public static void main(String[] args) {
    int[][] matrix = new int[2][3];
    int[][] predefinedMatrix = {{1, 2, 3}, {4, 5, 6}};

    for (int i = 0; i < matrix.length; i++) {
      for (int j = 0; j < matrix[i].length; j++) {
        matrix[i][j] = (i + j + 1);
      }
    }

    System.out.println("Matrix:");
    for (int[] row : matrix) {
      for (int val : row) {
        System.out.print(val + " ");
      }
      System.out.println();
    }

    System.out.println("Predefined Matrix:");
    for (int[] row : predefinedMatrix) {
      for (int val : row) {
        System.out.print(val + " ");
      }
      System.out.println();
    }
  }
}
```

```
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& javac TwoDimensionalArrayExample.java && java TwoDimensionalArrayExample
Matrix:
1 2 3
2 3 4
Predefined Matrix:
1 2 3
4 5 6
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```

3. Jagged Array

A jagged array is an array of arrays where each sub-array can have different lengths. This allows for more flexibility in storing data.

Syntax

```
dataType[][] jaggedArrayName = new dataType[numberOfRows][];
```

Initialization

You need to initialize each sub-array separately.

Example

```
class JaggedArrayExample {
  public static void main(String[] args) {
    int[][] jaggedArray = new int[3][];

    jaggedArray[0] = new int[2];
    jaggedArray[1] = new int[3];
    jaggedArray[2] = new int[1];

    jaggedArray[0][0] = 1;
    jaggedArray[0][1] = 2;

    jaggedArray[1][0] = 3;
    jaggedArray[1][1] = 4;
    jaggedArray[1][2] = 5;

    jaggedArray[2][0] = 6;
```

```
        System.out.println("Jagged Array:");
        for (int i = 0; i < jaggedArray.length; i++) {
            for (int j = 0; j < jaggedArray[i].length; j++) {
                System.out.print(jaggedArray[i][j] + " ");
            }
            System.out.println();
        }
    }
}
```

```
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& javac JaggedArrayExample.java && java JaggedArrayExample
Jagged Array:
1 2
3 4 5
6
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 %
```

3. WAP to compute sum and average of 5 double elements of array.

→

```
import java.util.Scanner;
class SumAndAverage {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        double[] array = new double[5];
        double sum = 0;
        for (int i = 0; i < 5; i++) {
            System.out.print("Enter element " + (i+1) + ": ");
            array[i] = scanner.nextDouble();
            sum += array[i];
        }
        double average = sum / 5;
        System.out.println("Sum: " + sum);
        System.out.println("Average: " + average);

        scanner.close();
    }
}
```

4. WAP to perform linear search in java.

→

```java
import java.util.Scanner;
class LinearSearch {
  public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);
    System.out.print("Enter the size of the array: ");
    int size = scanner.nextInt();
    int[] array = new int[size];

    System.out.println("Enter the elements of the array:");
    for (int i = 0; i < size; i++) {
      array[i] = scanner.nextInt();
    }

    System.out.print("Enter the number to search: ");
    int number = scanner.nextInt();
    boolean found = false;

    for (int i = 0; i < array.length; i++) {
      if (array[i] == number) {
        System.out.println("Number found at index " + i);
        found = true;
        break;
      }
    }

    if (!found) {
      System.out.println("Number not found in the array.");
    }
```

```
    scanner.close();
  }
```

```
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& javac LinearSearch.java && java LinearSearch
Enter the size of the array: 6
Enter the elements of the array:
1 2 3 4 5 6
Enter the number to search: 2
Number found at index 1
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 %
```

```
}
```

5. WAP to perform binary search in java.

→

```
import java.util.Scanner;
public class BinarySearch {
  public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);
    System.out.print("Enter the size of the array: ");
    int size = scanner.nextInt();
    int[] array = new int[size];
    System.out.println("Enter the elements of the array in sorted order:");
    for (int i = 0; i < size; i++) {
      array[i] = scanner.nextInt();
    }
    System.out.print("Enter the number to search: ");
    int number = scanner.nextInt();
    int result = binarySearch(array, number);
    if (result == -1) {
      System.out.println("Element not found in the array");
    } else {
      System.out.println("Element found at index " + result);
    }

    scanner.close();
  }
  public static int binarySearch(int[] array, int target) {
    int left = 0;
    int right = array.length - 1;
```

```
    while (left <= right) {
        int mid = left + (right - left) / 2;
        if (array[mid] == target) {
            return mid;
        } else if (array[mid] < target) {
            left = mid + 1;
        } else {
            right = mid - 1;
        }
    }
    return -1;
}
```

```
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& javac BinarySearch.java && java BinarySearch
Enter the size of the array: 5
Enter the elements of the array in sorted order:
1 2 3 4 5
Enter the number to search: 5
Element found at index 4
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```

6. Write a Java program to insert an element (specific position) into an array.

→

```
import java.util.Scanner;
public class SpecificPositionAdd {
  public static void insertElement(int[] array, int position, int element) {
    int[] newArray = new int[array.length + 1];
    System.arraycopy(array, 0, newArray, 0, position);
    newArray[position] = element;
    System.arraycopy(array, position, newArray, position + 1, array.length - position);
    array = newArray;
    for (int i = 0; i < array.length; i++) {
        System.out.print(array[i] + " ");
    }
  }
  public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);
    System.out.println("Enter the size of the array:");
    int size = scanner.nextInt();
```

```
    int[] array = new int[size];
    System.out.println("Enter the elements of the array:");
    for (int i = 0; i < size; i++) {
        array[i] = scanner.nextInt();
    }
    System.out.println("Enter the position where you want to insert the element:");
    int position = scanner.nextInt();
    System.out.println("Enter the element you want to insert:");
    int element = scanner.nextInt();
    System.out.println("Original array:");
    for (int i = 0; i < array.length; i++) {
        System.out.print(array[i] + " ");
    }
    System.out.println("\nArray after inserting element at position " + position + ":");
    insertElement(array, position, element);
    scanner.close();
  }
}
```

7. Write a Java program to remove a specific element from an array.

→

```
import java.util.Scanner;


public class SpecificPositionRemove {
  public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);
    System.out.print("Enter the size of the array: ");
    int size = scanner.nextInt();
    int[] array = new int[size];
    System.out.println("Enter the elements of the array: ");
```

```
        for (int i = 0; i < size; i++) {
            array[i] = scanner.nextInt();
        }
        System.out.print("Enter the index of the element to remove (0-" + (size - 1) + "): ");
        int removeIndex = scanner.nextInt();
        array = removeElement(array, removeIndex);
        System.out.println("Array after removing element at index " + removeIndex + ":");
        for (int i : array) {
            System.out.print(i + " ");
        }
        scanner.close();
    }

    public static int[] removeElement(int[] array, int index) {
        if (index < 0 || index >= array.length) {
            System.out.println("Invalid index. Returning original array.");
            return array;
        }
        int[] newArray = new int[array.length - 1];
        System.arraycopy(array, 0, newArray, 0, index);
        System.arraycopy(array, index + 1, newArray, index, array.length - index - 1);
        return newArray;


    }
}
```

```
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& javac SpecificPositionRemove.java && java SpecificPositionRemove
Enter the size of the array: 6
Enter the elements of the array:
6 1
5
2
4
3
Enter the index of the element to remove (0-5): 1
Array after removing element at index 1:
6 5 2 4 3
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```

8. Write a Java program to find the maximum and minimum value of an array.

→

```
import java.util.Scanner;
```

```java
public class MinAndMaxArray {
  public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);
    System.out.print("Enter the number of elements in the array: ");
    int n = scanner.nextInt();
    int[] array = new int[n];
    System.out.println("Enter the elements of the array: ");
    for(int i=0; i < n; i++){
      array[i] = scanner.nextInt();
    }
    int max = array[0];
    int min = array[0];
    for(int i=1; i < array.length; i++){
      if(array[i] > max){
        max = array[i];
      }else if(array[i] < min){
        min = array[i];
      }
    }
    System.out.println("Maximum Value is : " + max);
    System.out.println("Minimum Value is : " + min);
    scanner.close();
  }
}
```

9. Write a Java program to reverse an array of integer values.

→

```java
import java.util.Scanner;


public class ReverseArray {
  public static void main(String[] args) {
```

```
    Scanner scanner = new Scanner(System.in);
    System.out.print("Enter the size of the array: ");
    int size = scanner.nextInt();
    int[] array = new int[size];

    System.out.println("Enter the elements of the array: ");
    for (int i = 0; i < size; i++) {
        array[i] = scanner.nextInt();
    }

    System.out.println("Original array: ");
    for (int i = 0; i < size; i++) {
        System.out.print(array[i] + " ");
    }

    reverseArray(array);

    System.out.println("\nReversed array: ");
    for (int i = 0; i < size; i++) {
        System.out.print(array[i] + " ");
    }

    scanner.close();
}

public static void reverseArray(int[] array) {
    int left = 0;
    int right = array.length - 1;
    while (left < right) {
        int temp = array[left];
        array[left] = array[right];
        array[right] = temp;
        left++;
        right--;
```

```
    }
  }
```

```
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& javac ReverseArray.java && java ReverseArray
Enter the size of the array: 4
Enter the elements of the array:
43243223 3213 213312 12321342
Original array:
43243223 3213 213312 12321342
Reversed array:
12321342 213312 3213 43243223
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```

```
}
```

10.Write a Java program to find duplicate values in an array of integer values.

→

```
import java.util.Scanner;

public class DuplicateValueArray {
  public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);
    System.out.print("Enter the size of the array: ");
    int size = scanner.nextInt();
    int[] array = new int[size];

    System.out.println("Enter the elements of the array: ");
    for (int i = 0; i < size; i++) {
      array[i] = scanner.nextInt();
    }

    System.out.println("Duplicate values in the array are: ");
    for (int i = 0; i < size; i++) {
      for (int j = i + 1; j < size; j++) {
        if (array[i] == array[j]) {
          System.out.print(array[i] + " ");
        }
      }
    }

    scanner.close();
```

```
    }
}
```

```
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& javac DuplicateValueArray.java && java DuplicateValueArray
Enter the size of the array: 5
Enter the elements of the array:
1 2 5 3 2
Duplicate values in the array are:
2
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```

11.Write a Java program to find duplicate values in an array of string values.

→

```java
import java.util.Scanner;

public class DuplicateArrayFind {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the size of the array: ");
        int size = scanner.nextInt();
        String[] array = new String[size];

        System.out.println("Enter the elements of the array: ");
        for (int i = 0; i < size; i++) {
            array[i] = scanner.next();
        }

        System.out.println("Duplicate values in the array are: ");
        for (int i = 0; i < size; i++) {
            for (int j = i + 1; j < size; j++) {
                if (array[i].equals(array[j])) {
                    System.out.print(array[i] + " ");
                }
            }
        }

        scanner.close();
    }
}
```

```
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& javac DuplicateArrayFind.java && java DuplicateArrayFind
Enter the size of the array: 4
Enter the elements of the array:
sd sd sd sa d
Duplicate values in the array are:
sd sd sd sd sd sd
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 %
```

12.WAP to perform matrix addition in java.

→

```java
public class MatrixAddition {
  public static void main(String[] args) {
      int[][] matrix1 = {{1, 2, 3}, {4, 5, 6}, {7, 8, 9}};
      int[][] matrix2 = {{10, 11, 12}, {13, 14, 15}, {16, 17, 18}};

      int[][] result = addMatrices(matrix1, matrix2);

      System.out.println("Matrix 1:");
      printMatrix(matrix1);
      System.out.println("Matrix 2:");
      printMatrix(matrix2);
      System.out.println("Result:");
      printMatrix(result);
  }

  public static int[][] addMatrices(int[][] matrix1, int[][] matrix2) {
      int rows = matrix1.length;
      int cols = matrix1[0].length;
      int[][] result = new int[rows][cols];

      for (int i = 0; i < rows; i++) {
          for (int j = 0; j < cols; j++) {
              result[i][j] = matrix1[i][j] + matrix2[i][j];
          }
      }

      return result;
  }
```

```
  public static void printMatrix(int[][] matrix) {
      for (int i = 0; i < matrix.length; i++) {
          for (int j = 0; j < matrix[0].length; j++) {
              System.out.print(matrix[i][j] + " ");
          }
          System.out.println();
      }
  }
}
```

```
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& javac MatrixAddition.java && java MatrixAddition
Matrix 1:
1 2 3
4 5 6
7 8 9
Matrix 2:
10 11 12
13 14 15
16 17 18
Result:
11 13 15
17 19 21
23 25 27
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```

13.WAP to perform matrix multiplication in java.

→

```
public class MatrixMultiplication {
  public static void main(String[] args) {
      int[][] matrix1 = {{1, 2, 3}, {4, 5, 6}, {7, 8, 9}};
      int[][] matrix2 = {{10, 11, 12}, {13, 14, 15}, {16, 17, 18}};

      int[][] result = multiplyMatrices(matrix1, matrix2);

      System.out.println("Matrix 1:");
      printMatrix(matrix1);
      System.out.println("Matrix 2:");
      printMatrix(matrix2);
      System.out.println("Result:");
      printMatrix(result);
  }

  public static int[][] multiplyMatrices(int[][] matrix1, int[][] matrix2) {
      int rows = matrix1.length;
      int cols = matrix2[0].length;
      int[][] result = new int[rows][cols];
```

```
    for (int i = 0; i < rows; i++) {
        for (int j = 0; j < cols; j++) {
            for (int k = 0; k < matrix1[0].length; k++) {
                result[i][j] += matrix1[i][k] * matrix2[k][j];
            }
        }
    }

    return result;
  }

  public static void printMatrix(int[][] matrix) {
    for (int i = 0; i < matrix.length; i++) {
        for (int j = 0; j < matrix[0].length; j++) {
            System.out.print(matrix[i][j] + " ");
        }
        System.out.println();
    }
  }
}
```

```
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& javac MatrixMultiplication.java && java MatrixMultiplication
Matrix 1:
1 2 3
4 5 6
7 8 9
Matrix 2:
10 11 12
13 14 15
16 17 18
Result:
84 90 96
201 216 231
318 342 366
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```

14.Explain String class and specify different ways to create String objects.

→

The String class in Java is a fundamental part of the language, representing a sequence of characters. Strings are immutable, meaning once a String object is created, its value cannot be changed. This immutability allows for efficient memory management and thread safety.

Characteristics of the String Class

- Immutability: Once a String object is created, it cannot be modified. Any operation that seems to modify a string actually creates a new string.

- String Pool: Java maintains a pool of strings to optimize memory usage. When you create a string literal, Java checks this pool first to see if an identical string already exists.

Ways to Create String Objects

There are several ways to create String objects in Java:

1. Using String Literals:
   - You can create a string using double quotes. If the same string literal is created again, it will reference the existing object in the string pool.

```
String str1 = "Hello, World!";
```

2. Using the new Keyword:
   - This method explicitly creates a new String object in heap memory, regardless of whether an identical string exists in the pool.

```
String str2 = new String("Hello, World!")
```

3. Using Character Arrays:
   - You can also create a string from an array of characters.

```
char[] chars = {'H', 'e', 'l', 'l', 'o'};
String str3 = new String(chars);
```

4. Using Byte Arrays:
   - Strings can be created from byte arrays using the default character encoding or specified encoding.

```
byte[] bytes = {72, 101, 108, 108, 111}; // ASCII values for 'Hello'
String str4 = new String(bytes);
String str5 = new String(bytes, "UTF-8");// Using specific charset
```

5. Using StringBuilder
   - For mutable strings (strings that can change), you can use StringBuilder .These classes allow for dynamic modification of strings.

```
StringBuilder sb = new StringBuilder();
sb.append("Hello");
sb.append(", World!");
String str6 = sb.toString(); // Converts to String
```

15. WAP to demonstrate the functionality of all the methods of String class.

1. int length()
2. char charAt(int index)
3. int indexOf(int ch)
4. int indexOf(int ch, int fromIndex)
5. int indexOf(String substring)

6. int indexOf(String substring, int fromIndex)
7. lastIndexOf( )
8. String substring(int beginIndex)
9. String substring(int beginIndex, int endIndex)
10.boolean contains(CharSequence s)
11.String concat(String s)
12.boolean equals(Object o)
13.boolean equalsIgnoreCase(String s)
14.boolean isEmpty()
15.boolean equals(Object o)
16.boolean equalsIgnoreCase(String s)
17.String toLowerCase()
18.String toUpperCase()
19.int compareTo(String anotherString)
20.int compareToIgnoreCase(String anotherString)
21.String trim()
22. String replace (char oldChar, char newChar)
23.char[] toCharArray()
24. boolean startsWith(String s)
25.boolean endswith(String s)
26.static String join(CharSequence delim, CharSequence . . . strs)
→

```
import java.util.Arrays;


public class Stringclass {
  public static void main(String[] args) {
     String str = "Hello, World!";
     System.out.println("Length of the string: " + str.length());
     System.out.println("Character at index 4: " + str.charAt(4));
     System.out.println("Index of 'o': " + str.indexOf('o'));
     System.out.println("Index of 'o' after index 5: " + str.indexOf('o', 5));
     System.out.println("Index of 'World': " + str.indexOf("World"));
     System.out.println("Index of 'World' after index 5: " + str.indexOf("World", 5));
     System.out.println("Last index of 'o': " + str.lastIndexOf('o'));
     System.out.println("Substring from index 7: " + str.substring(7));
     System.out.println("Substring from index 7 to 12: " + str.substring(7, 12));
     System.out.println("Contains 'World': " + str.contains("World"));
     System.out.println("Concatenation with '!' : " + str.concat("!"));
     System.out.println("Equals 'Hello, World!': " + str.equals("Hello, World!"));
     System.out.println("Equals ignore case 'hello, world!': " + str.equalsIgnoreCase("hello, world!"));
     System.out.println("Is empty: " + str.isEmpty());
     System.out.println("To lower case: " + str.toLowerCase());
     System.out.println("To upper case: " + str.toUpperCase());
```

```
    System.out.println("Compare to 'Hello, World!': " + str.compareTo("Hello, World!"));
    System.out.println("Compare to ignore case 'hello, world!': " + str.compareToIgnoreCase("hello, world!"));
    System.out.println("Trim: " + str.trim());
    System.out.println("Replace 'o' with '0': " + str.replace('o', '0'));
    System.out.println("To char array: " + Arrays.toString(str.toCharArray()));
    System.out.println("Starts with 'Hello': " + str.startsWith("Hello"));
    System.out.println("Ends with 'World!': " + str.endsWith("World!"));
    System.out.println("Join with ', ': " + String.join(", ", "Hello", "World!"));
  }
}
```

```
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 % cd "/Users/hitarth/Desktop/ISU/SFT/SEM2/Sprint1/JAVA/Assignments/HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3/" &
& javac Stringclass.java && java Stringclass
Length of the string: 13
Character at index 4: o
Index of 'o': 4
Index of 'o' after index 5: 8
Index of 'World': 7
Index of 'World' after index 5: 7
Last index of 'o': 8
Substring from index 7: World!
Substring from index 7 to 12: World
Contains 'World': true
Concatenation with '!' : Hello, World!!
Equals 'Hello, World!': true
Equals ignore case 'hello, world!': true
Is empty: false
To lower case: hello, world!
To upper case: HELLO, WORLD!
Compare to 'Hello, World!': 0
Compare to ignore case 'hello, world!': 0
Trim: Hello, World!
Replace 'o' with '0': Hell0, W0rld!
To char array: [H, e, l, l, o, ,,  , W, o, r, l, d, !]
Starts with 'Hello': true
Ends with 'World!': true
Join with ', ': Hello, World!
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 %
```

Q16. Write a program to compare two strings lexicographically, ignoring case differences.

→

```
public class TwoString {
  public static void main(String[] args) {
    String str1 = "Hello";
    String str2 = "hello";

    int result = str1.compareToIgnoreCase(str2);

    if (result < 0) {
      System.out.println(str1 + " is lexicographically smaller than " + str2);
    } else if (result > 0) {
      System.out.println(str1 + " is lexicographically larger than " + str2);
    } else {
      System.out.println(str1 + " and " + str2 + " are lexicographically equal");
    }
  }
}
```

```
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 % cd "/Users/hitarth/Desktop/ISU/SFT/SEM2/Sprint1/JAVA/Assignments/HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3/" &
& javac TwoString.java && java TwoString
Hello and hello are lexicographically equal
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 %
```

Q17. Write a program to check whether two String objects contain the same data.

→

```java
public class TwoStringCheck {
    public static void main(String[] args) {
        String str1 = "Hello";
        String str2 = "Hello";
        if (str1.equals(str2)) {
            System.out.println("Both strings contain the same data.");
        } else {
            System.out.println("Both strings do not contain the same data.");
        }
    }
}
```

```
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 % cd "/Users/hitarth/Desktop/ISU/SFT/SEM2/Sprint1/JAVA/Assignments/HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3/" &
& javac TwoStringCheck.java && java TwoStringCheck
Both strings contain the same data.
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 %
```

Q18. Write a program to replace each substring of a given string.

→

```java
public class ReplaceSubstring {
    public static void main(String[] args) {
        String str = "Hello, World!";
        String oldSubStr = "World";
        String newSubStr = "Universe";

        String newStr = str.replace(oldSubStr, newSubStr);

        System.out.println("Original String: " + str);
        System.out.println("New String: " + newStr);
    }
}
```

```
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 % cd "/Users/hitarth/Desktop/ISU/SFT/SEM2/Sprint1/JAVA/Assignments/HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3/" &
& javac ReplaceSubstring.java && java ReplaceSubstring
Original String: Hello, World!
New String: Hello, Universe!
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 %
```

Q19. Write a Java program to check whether a given string starts with the contents of another string.

→

```java
public class CheckString {
    public static void main(String[] args) {
     String mainString = "Hello World";
     String subString = "Hello";
     System.out.println("Does '" + mainString + "' start with '" + subString + "'? " + mainString.startsWith(subString));
  }
}
```

```
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 % cd "/Users/hitarth/Desktop/ISU/SFT/SEM2/Sprint1/JAVA/Assignments/HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3/" &
 & javac CheckString.java && java CheckString
 Does 'Hello World' start with 'Hello'? true
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 %
```

Q20. Write a Java program to create a new string repeating every character twice of a given string.

→

```java
public class NewString {
  public static void main(String[] args) {
     String str = "hello";
     String newStr = "";
     for (int i = 0; i < str.length(); i++) {
        newStr += str.charAt(i);
        newStr += str.charAt(i);
     }
     System.out.println(newStr);
  }
}
```

```
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 % cd "/Users/hitarth/Desktop/ISU/SFT/SEM2/Sprint1/JAVA/Assignments/HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3/" &
 & javac NewString.java && java NewString
 hheellllloo
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 %
```

Q21. Write a Java program to return the sum of the digits present in the given string. If there is no digits the sum return is 0.

→

```java
import java.util.Scanner;

public class SumDigits {
```

```
  public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);
      System.out.println("Enter a string:");
      String input = scanner.nextLine();
      int sum = 0;

      for (char c : input.toCharArray()) {
          if (Character.isDigit(c)) {
              sum += Integer.parseInt(String.valueOf(c));
          }
      }
      System.out.println("Sum of digits in the string: " + sum);
      scanner.close();
  }
}
```

```
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 % cd "/Users/hitarth/Desktop/ISU/SFT/SEM2/Sprint1/JAVA/Assignments/HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3/" &
& javac SumDigits.java && java SumDigits
Enter a string:
1231231231
Sum of digits in the string: 19
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 %
```

Q22. Write a Java program to Count words in Given String.

→

```
public class CountWord {
  public static void main(String[] args) {
      String str = "This is a sample string";
      int count = 1;

      for (int i = 0; i < str.length() - 1; i++) {
          if ((str.charAt(i) == ' ') && (str.charAt(i + 1) != ' ')) {
              count++;
          }
      }

      System.out.println("Number of words in the string: " + count);
  }
}
```

```
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 % cd "/Users/hitarth/Desktop/ISU/SFT/SEM2/Sprint1/JAVA/Assignments/HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3/" &
& javac CountWord.java && java CountWord
Number of words in the string: 5
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 %
```

Q23. Write a Java program to Swap Two Strings.

→

```java
public class SwapString {
  public static void main(String[] args) {
    String str1 = "Hello";
    String str2 = "World";

    System.out.println("Before swapping:");
    System.out.println("String 1: " + str1);
    System.out.println("String 2: " + str2);

    String temp = str1;
    str1 = str2;
    str2 = temp;

    System.out.println("After swapping:");
    System.out.println("String 1: " + str1);
    System.out.println("String 2: " + str2);
  }
}
```

```
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 % cd "/Users/hitarth/Desktop/ISU/SFT/SEM2/Sprint1/JAVA/Assignments/HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3/" &
 & javac SwapString.java && java SwapString
 Before swapping:
 String 1: Hello
 String 2: World
 After swapping:
 String 1: World
 String 2: Hello
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 %
```

Q24. Write a Java program to Swap Two Strings without Third String Variable.

→

```java
public class SwapTwoString {
  public static void main(String[] args) {
    String str1 = "Hello";
    String str2 = "World";

    System.out.println("Before swapping:");
    System.out.println("String 1: " + str1);
    System.out.println("String 2: " + str2);

    str1 = str1 + str2;
    str2 = str1.substring(0, str1.length() - str2.length());
    str1 = str1.substring(str2.length());
```

```
    System.out.println("After swapping:");
    System.out.println("String 1: " + str1);
    System.out.println("String 2: " + str2);
  }
}
```

```
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 % cd "/Users/hitarth/Desktop/ISU/SFT/SEM2/Sprint1/JAVA/Assignments/HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3/" &
& javac SwapTwoString.java && java SwapTwoString
Before swapping:
String 1: Hello
String 2: World
After swapping:
String 1: World
String 2: Hello
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 %
```

Q25. Write a Java program to Reverse Each Word of a String.

→

```
class Reverseword {
  public static void main(String[] args) {
    String str = "Hello World";
    String[] words = str.split(" ");
    for (int i = 0; i < words.length; i++) {
      String word = words[i];
      String reversedWord = new StringBuilder(word).reverse().toString();
      System.out.print(reversedWord + " ");
    }
  }
}
```

```
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 % cd "/Users/hitarth/Desktop/ISU/SFT/SEM2/Sprint1/JAVA/Assignments/HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3/" &
& javac Reverseword.java && java Reverseword
olleH dlroW
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 %
```

Q26. Java String program to check whether a string is a Palindrome.

→

```
public class palindrome {
  public static void main(String[] args) {
    String str = "radar";
    String reversed = new StringBuilder(str).reverse().toString();
    if (str.equals(reversed)) {
      System.out.println(str + " is a palindrome");
    } else {
      System.out.println(str + " is not a palindrome");
    }
```

```
    }
}
```

```
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 % cd "/Users/hitarth/Desktop/ISU/SFT/SEM2/Sprint1/JAVA/Assignments/HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3/" &
 & javac palindrome.java && java palindrome
 radar is a palindrome
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 %
```

Q27. Program to Check Two Strings Are Anagram Of Each Other in Java.

→

```
public class Anagram {
    public static boolean areAnagrams(String str1, String str2) {
        if (str1.length() != str2.length()) {
            return false;
        }

        char[] charArray1 = str1.toLowerCase().toCharArray();
        char[] charArray2 = str2.toLowerCase().toCharArray();

        java.util.Arrays.sort(charArray1);
        java.util.Arrays.sort(charArray2);

        return java.util.Arrays.equals(charArray1, charArray2);
    }

    public static void main(String[] args) {
        System.out.println(areAnagrams("listen", "silent"));
        System.out.println(areAnagrams("hello", "world"));
    }
}
```

```
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 % cd "/Users/hitarth/Desktop/ISU/SFT/SEM2/Sprint1/JAVA/Assignments/HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3/" &
 & javac Anagram.java && java Anagram
 true
 false
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 %
```

Q28. Write a Java program to Count Number of Uppercase and Lowercase letters.

→

```
import java.util.Scanner;

public class UpperLowerCaseCount {
    public static void main(String[] args) {
```

```
    Scanner scanner = new Scanner(System.in);
    System.out.println("Enter a string: ");
    String str = scanner.nextLine();
    int upper = 0, lower = 0;

    for (int i = 0; i < str.length(); i++) {
        char ch = str.charAt(i);
        if (Character.isUpperCase(ch)) {
            upper++;
        } else if (Character.isLowerCase(ch)) {
            lower++;
        }
    }

    System.out.println("Number of uppercase letters: " + upper);
    System.out.println("Number of lowercase letters: " + lower);

    scanner.close();
  }
}
```

```
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 % cd "/Users/hitarth/Desktop/ISU/SFT/SEM2/Sprint1/JAVA/Assignments/HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3/" &
& javac UpperLowerCaseCount.java && java UpperLowerCaseCount
Enter a string:
HelloMY
Number of uppercase letters: 3
Number of lowercase letters: 4
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 %
```

Q29. Write a Java program to Given string Convert Uppercase to Lowercase.

→

```
public class UpperToLower {
  public static void main(String[] args) {
    String str = "HELLO WORLD";
    System.out.println("Original String: " + str);
    System.out.println("Lowercase String: " + str.toLowerCase());
  }
}
```

```
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 % cd "/Users/hitarth/Desktop/ISU/SFT/SEM2/Sprint1/JAVA/Assignments/HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3/" &
& javac UpperToLower.java && java UpperToLower
Original String: HELLO WORLD
Lowercase String: hello world
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 %
```

Q30. Write a Java program to check if the letter 'e' is present in the word 'Hello World'.

→

```java
public class Replace {
  public static void main(String[] args) {
    String word = "Hello World";
    if (word.contains("e")) {
      System.out.println("The letter 'e' is present in the word.");
    } else {
      System.out.println("The letter 'e' is not present in the word.");
    }
  }
}
```

```
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 % cd "/Users/hitarth/Desktop/ISU/SFI/SEM2/Sprint1/JAVA/Assignments/HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3/" &
& javac UpperToLower.java && java UpperToLower
Original String: HELLO WORLD
Lowercase String: hello world
hitarth@Shadow HitarthPatel_150096724046_21JAN2025_Java_Assignemnt_3 %
```

Q31. Differentiate between String and StringBuilder.

→

Feature	String	StringBuilder
Mutability	Immutable (cannot be changed once created)	Mutable (can be modified)
Performance	Slower for modifications due to immutability	Faster for frequent modifications
Memory Storage	Stored in the String Pool	Stored in the heap

Thread Safety	Thread-safe due to immutability	Not thread-safe (not synchronized)
Concatenation	Each concatenation creates a new object	Uses append() method for efficient concatenation
Usage Scenarios	Best for fixed text or when thread safety is required	Ideal for dynamic text changes in single-threaded environments

Q32. Explain StringBuilder class. What is the initial capacity of StringBuilder object. Explain constructors. Explain the following methods of String Builder class along with examples:
i. compareTo()
ii. delete()
iii. deleteCharAt()
iv. ensureCapacity()
v. getChars()
vi. insert()
vii. indexOf()
viii. lastIndexOf()
ix. setCharAt()
x. setLength()
xi. append()
xii. charAt()
xiii. reverse()
xiv. length()
xv. capacity()
xvi. substring()
xvii. replace()
→

StringBuilder Class in Java

The StringBuilder class in Java is part of the java.lang package and provides a mutable sequence of characters. Unlike the String class, which is immutable, StringBuilder allows for modifications without creating new objects, making it more efficient for string manipulation.

Initial Capacity

The default initial capacity of a StringBuilder object is 16 characters. If the number of characters exceeds this capacity, the capacity is increased dynamically by (old capacity * 2) + 2.

Constructors of StringBuilder

1. StringBuilder()
    - Creates an empty StringBuilder with a default initial capacity of 16.

```
StringBuilder sb1 = new StringBuilder();
```

2. StringBuilder(int capacity)
    - Creates a StringBuilder with the specified initial capacity.

```
StringBuilder sb2 = new StringBuilder(50);
```

3. StringBuilder(String str)
    - Creates a StringBuilder initialized with the contents of the specified string.

```
StringBuilder sb3 = new StringBuilder("Hello");
```

4. StringBuilder(CharSequence seq)
    - Creates a StringBuilder initialized with the contents of the given CharSequence.

```
CharSequence cs = "World";
StringBuilder sb4 = new StringBuilder(cs);
```

Methods of StringBuilder

Here are explanations and examples for various methods of the StringBuilder class:

1. compareTo(String anotherString)
    - Compares two strings lexicographically.

```
StringBuilder sb1 = new StringBuilder("abc");
System.out.println(sb1.compareTo("abd"));// Output: -1
```

2. delete(int start, int end)
    - Removes characters from the specified start index to end index (exclusive).

```
StringBuilder sb2 = new StringBuilder("Hello World");
sb2.delete(5, 11); // Removes " World"
System.out.println(sb2); // Output: "Hello"
```

3. deleteCharAt(int index)
    - Removes the character at the specified index.

```
StringBuilder sb3 = new StringBuilder("Hello");
sb3.deleteCharAt(0); // Removes 'H'
```

```
System.out.println(sb3); // Output: "ello"
```

4. ensureCapacity(int minimumCapacity)
    - Ensures that the capacity is at least equal to the specified minimum.

```
StringBuilder sb4 = new StringBuilder();
sb4.ensureCapacity(50);
System.out.println(sb4.capacity()); // Output: 50
```

5. getChars(int srcBegin, int srcEnd, char[] dst, int dstBegin)
    - Copies characters from this string builder into the destination character array.

```
StringBuilder sb5 = new StringBuilder("Hello");
char[] chars = new char[5];
sb5.getChars(0, 5, chars, 0);
System.out.println(chars); // Output: Hello
```

6. insert(int offset, String str)
    - Inserts the specified string at the given position.

```
StringBuilder sb6 = new StringBuilder("Hello");
sb6.insert(5, " World");
System.out.println(sb6); // Output: "Hello World"
```

7. indexOf(String str)
    - Returns the index within this string builder of the first occurrence of the specified substring.

```
StringBuilder sb7 = new StringBuilder("Hello World");
System.out.println(sb7.indexOf("World")); // Output: 6
```

8. lastIndexOf(String str)
    - Returns the index within this string builder of the last occurrence of the specified substring.

```
System.out.println(sb7.lastIndexOf("o")); // Output: 7
```

9. setCharAt(int index, char ch)
    - Replaces the character at the specified index with a new character.

```
sb6.setCharAt(0, 'h'); // Changes 'H' to 'h'
System.out.println(sb6); // Output: "hello World"
```

10. setLength(int newLength)
    - Sets the length of this string builder to the specified value.

```
sb6.setLength(5); // Trims to "hello"
System.out.println(sb6); // Output: "hello"
```

11. append(String str)

- Appends the specified string to this string builder.

```
sb6.append(" Everyone");

System.out.println(sb6); // Output: "hello Everyone"
```

12. charAt(int index)
    - Returns the character at the specified index.

```
System.out.println(sb6.charAt(1)); // Output: 'e'
```

13. reverse()
    - Reverses the sequence of characters in this string builder.

```
sb6.reverse();

System.out.println(sb6); // Output: "enoyrevE olleh"
```

14. length()
    - Returns the number of characters in this string builder.

```
System.out.println(sb6.length()); // Output: 12 (length after reversing)
```

15. capacity()
    - Returns the current capacity of this string builder.

```
System.out.println(sb6.capacity()); // Output may vary based on operations performed
```

16. substring(int start, int end)
    - Returns a substring from this string builder.

```
System.out.println(sb7.substring(0, 5)); // Output: "Hello"
```

17. replace(int start, int end, String str)
    - Replaces characters in a substring with the specified string.

```
sb7.replace(0, 5, "Hi");

System.out.println(sb7); // Output: "Hi World"
```