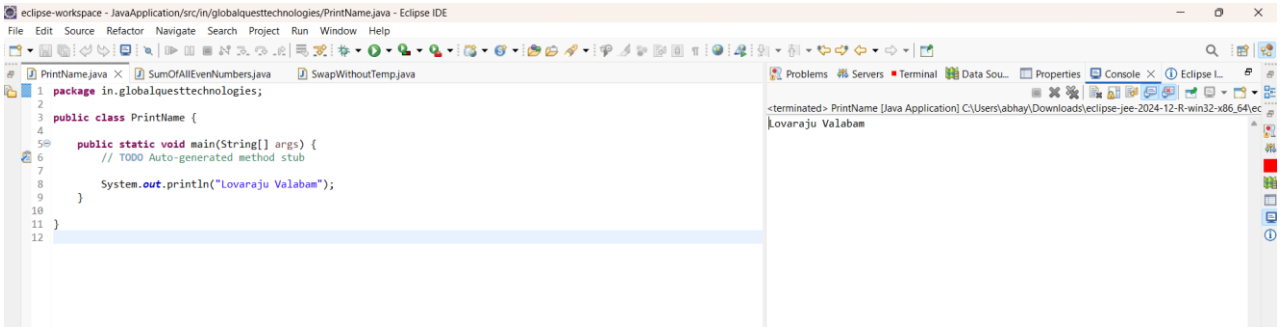
GLOBAL QUEST TECHNOLOGIES

CORE JAVA PROGRAMS

SUBHARANJAN NAYAK

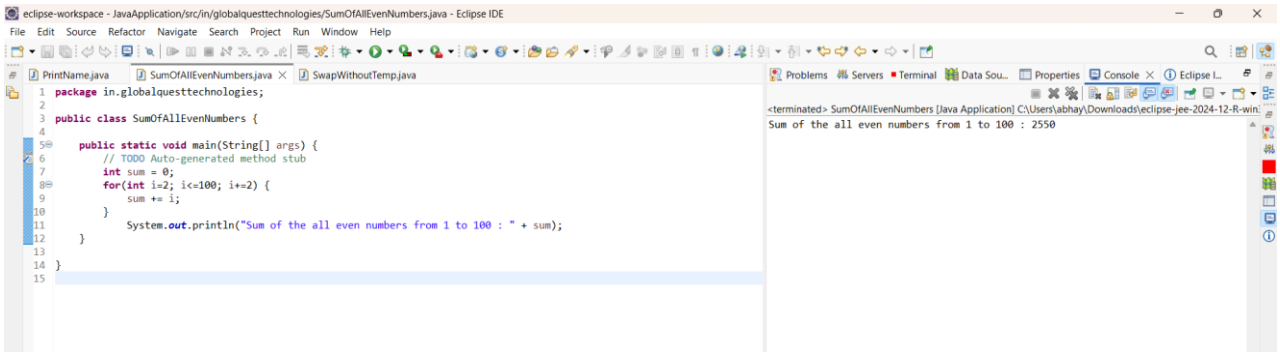
Introduction:

1. Write a Java program to print your name.




```
package in.globalquesttechnologies;
public class PrintName {
public static void main(String[] args) {
		// TODO Auto-generated method stub
System.out.println("Lovaraju Valabam");
	}}
```

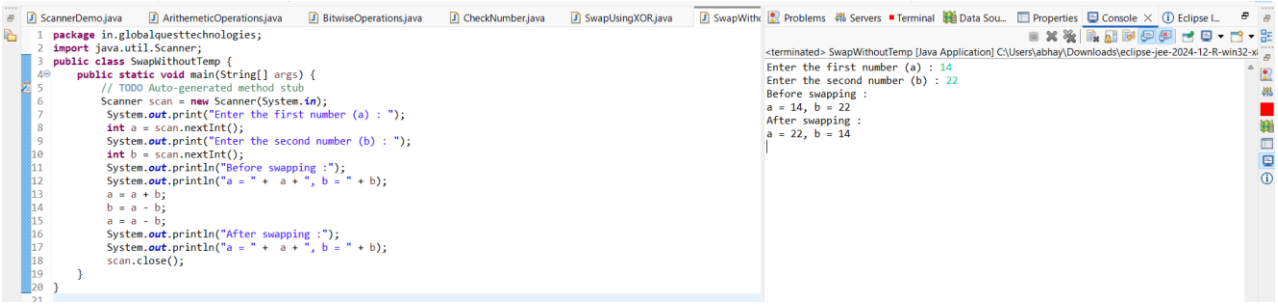
2. Write a program to print the sum of all even numbers from 1 to 100.




```
 package in.globalquesttechnologies;

public class SumOfAllEvenNumbers {

	public static void main(String[] args) {
		// TODO Auto-generated method stub
		int sum = 0;
		for(int i=2; i<=100; i+=2) {
			sum += i;
		}
			System.out.println("Sum of the all even numbers from 1 to 100 : " + sum);
	}
}
```

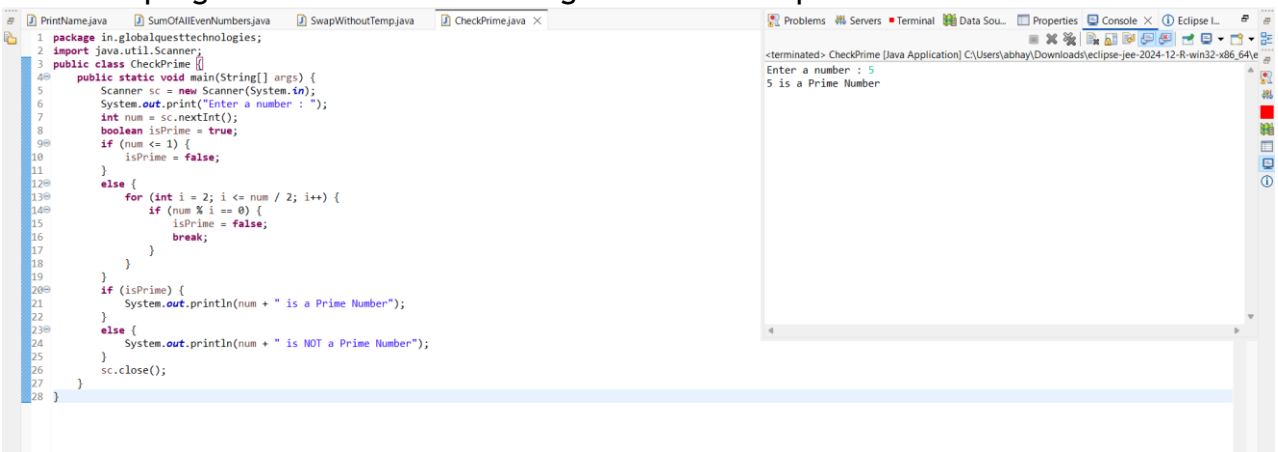
Write a program to

1. Write a program swap two numbers without using a temporary variable.




```
package in.globalquesttechnologies;
import java.util.Scanner;
public class SwapWithoutTemp {
	public static void main(String[] args) {
		// TODO Auto-generated method stub
		Scanner scan = new Scanner(System.in);
		 System.out.print("Enter the first number (a) : ");
		 int a = scan.nextInt();
		 System.out.print("Enter the second number (b) : ");
		 int b = scan.nextInt();
		 System.out.println("Before swapping :");
		 System.out.println("a = " +  a + ", b = " + b);
		 a = a + b;
		 b = a - b;
		 a = a - b;
		 System.out.println("After swapping :");
		 System.out.println("a = " +  a + ", b = " + b);
		 scan.close();
	}
}
```

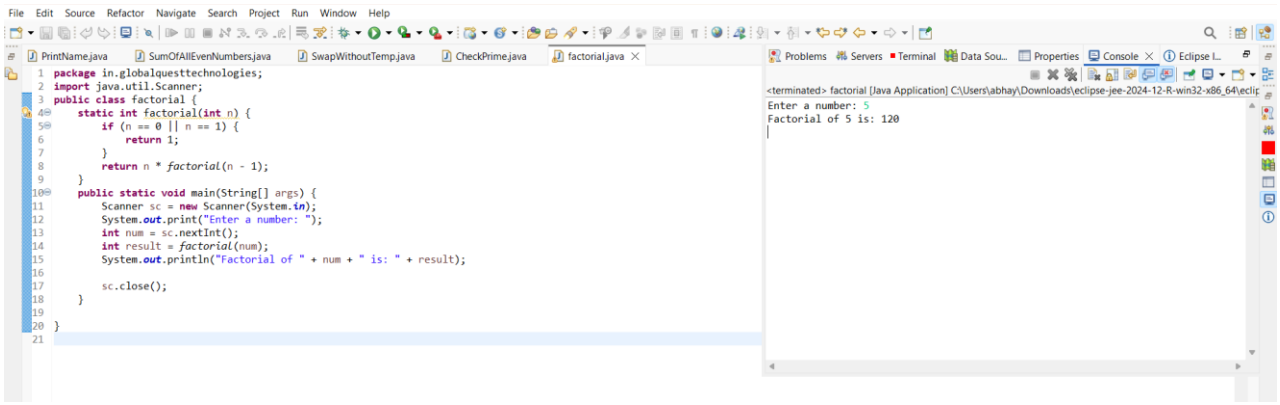
4.Write a program to check whether a given number is prime or not.




```
package in.globalquesttechnologies;
import java.util.Scanner;
public class CheckPrime {
public static void main(String[] args) {
	Scanner sc = new Scanner(System.in);
	System.out.print("Enter a number : ");
      int num = sc.nextInt();
      boolean isPrime = true;
```

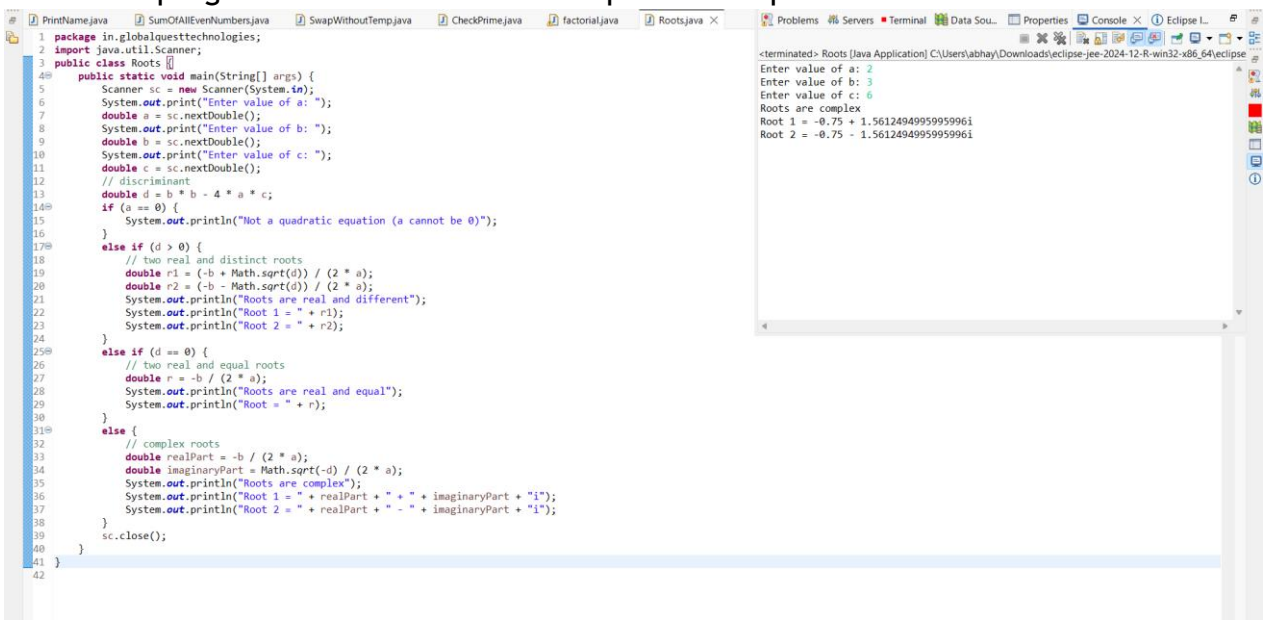
```
        if (num <= 1) {
            isPrime = false;
        }
        else {
            for (int i = 2; i <= num / 2; i++) {
                if (num % i == 0) {
                    isPrime = false;
                    break;
                }
            }
        }
        if (isPrime) {
            System.out.println(num + " is a Prime Number");
        }
        else {
            System.out.println(num + " is NOT a Prime Number");
        }
        sc.close();
}
}
```

5. Write a program to calculate the factorial of a given number using recursion.




```
package in.globalquesttechnologies;
import java.util.Scanner;
public class factorial {
        static int factorial(int n) {
        if (n == 0 || n == 1) {
            return 1;
        }
        return n * factorial(n - 1);
    }
        public static void main(String[] args) {
                Scanner sc = new Scanner(System.in);
        System.out.print("Enter a number: ");
        int num = sc.nextInt();
        int result = factorial(num);
        System.out.println("Factorial of " + num + " is: " + result);

        sc.close();
        }
}
```

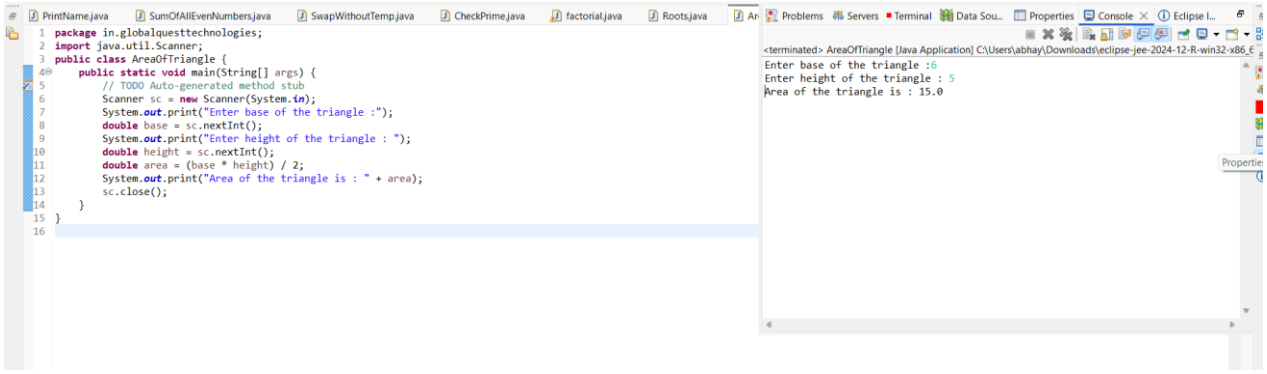
6. Write a program to find the roots of a quadratic equation.




```
package in.globalquesttechnologies;
import java.util.Scanner;
public class Roots {
public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
      System.out.print("Enter value of a: ");
      double a = sc.nextDouble();
      System.out.print("Enter value of b: ");
      double b = sc.nextDouble();
      System.out.print("Enter value of c: ");
      double c = sc.nextDouble();
      // discriminant
      double d = b * b - 4 * a * c;
      if (a == 0) {
         System.out.println("Not a quadratic equation (a cannot be 0)");
      }
      else if (d > 0) {
         // two real and distinct roots
         double r1 = (-b + Math.sqrt(d)) / (2 * a);
         double r2 = (-b - Math.sqrt(d)) / (2 * a);
         System.out.println("Roots are real and different");
         System.out.println("Root 1 = " + r1);
         System.out.println("Root 2 = " + r2);
      }
      else if (d == 0) {
         // two real and equal roots
         double r = -b / (2 * a);
         System.out.println("Roots are real and equal");
   System.out.println("Root = " + r);
      }
      else {
         // complex roots
         double realPart = -b / (2 * a);
         double imaginaryPart = Math.sqrt(-d) / (2 * a);
         System.out.println("Roots are complex");
         System.out.println("Root 1 = " + realPart + " + " + imaginaryPart + "i");
```

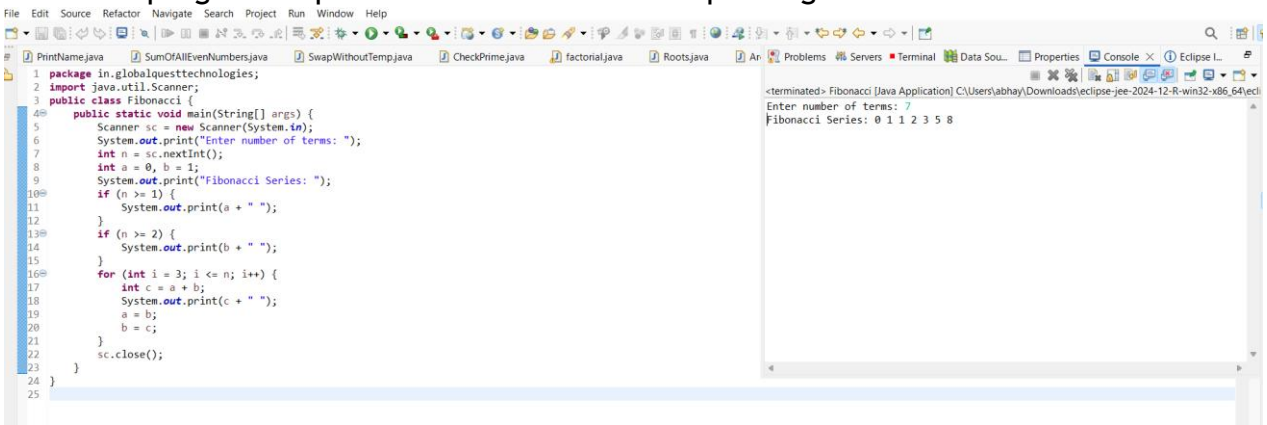
```
            System.out.println("Root 2 = " + realPart + " - " + imaginaryPart + "i");
        }
        sc.close();
}
}
```

7. Write a program to Calculate the area of a triangle.




```
package in.globalquesttechnologies;
import java.util.Scanner;
public class AreaOfTriangle {
        public static void main(String[] args) {
                // TODO Auto-generated method stub
                Scanner sc = new Scanner(System.in);
                System.out.print("Enter base of the triangle :");
                double base = sc.nextInt();
                System.out.print("Enter height of the triangle : ");
                double height = sc.nextInt();
                double area = (base * height) / 2;
                System.out.print("Area of the triangle is : " + area);
                sc.close();
        }
}
```

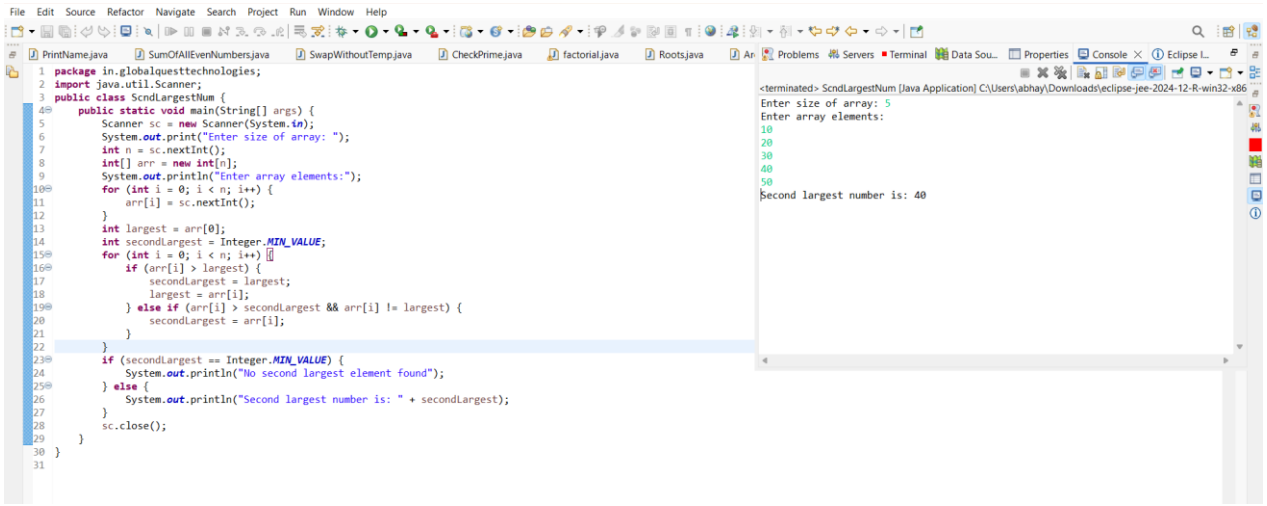
8.Write a program to print the Fibonacci series up to a given number of terms.




```
package in.globalquesttechnologies;
import java.util.Scanner;
public class Fibonacci {
        public static void main(String[] args) {
                Scanner sc = new Scanner(System.in);
        System.out.print("Enter number of terms: ");
        int n = sc.nextInt();
        int a = 0, b = 1;
        System.out.print("Fibonacci Series: ");
```

```
        if (n >= 1) {
            System.out.print(a + " ");
        }
        if (n >= 2) {
            System.out.print(b + " ");
        }
        for (int i = 3; i <= n; i++) {
            int c = a + b;
            System.out.print(c + " ");
            a = b;
            b = c;
        }
        sc.close();
            }
}
```

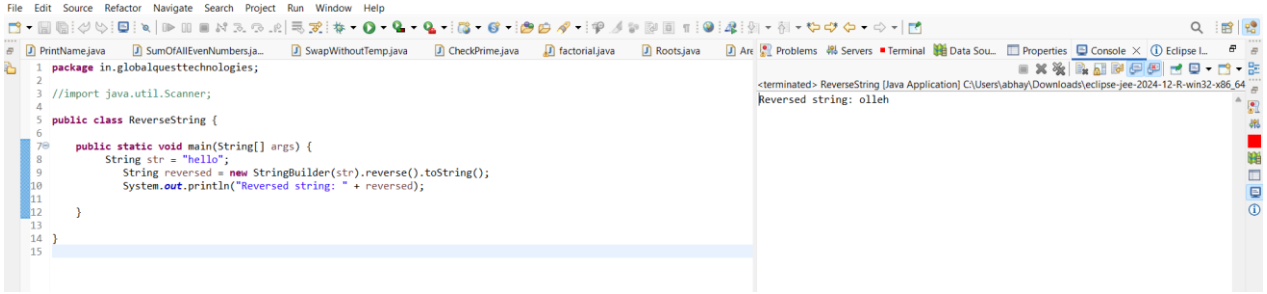
9. find the second largest number in an array




```
package in.globalquesttechnologies;
import java.util.Scanner;
public class ScndLargestNum {
public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);
        System.out.print("Enter size of array: ");
        int n = sc.nextInt();
        int[] arr = new int[n];
        System.out.println("Enter array elements:");
        for (int i = 0; i < n; i++) {
            arr[i] = sc.nextInt();
        }
        int largest = arr[0];
        int secondLargest = Integer.MIN_VALUE;
        for (int i = 0; i < n; i++) {
            if (arr[i] > largest) {
                secondLargest = largest;
                largest = arr[i];
            } else if (arr[i] > secondLargest && arr[i] != largest) {
                secondLargest = arr[i];
            }
        }
        if (secondLargest == Integer.MIN_VALUE) {
            System.out.println("No second largest element found");
        } else {
```

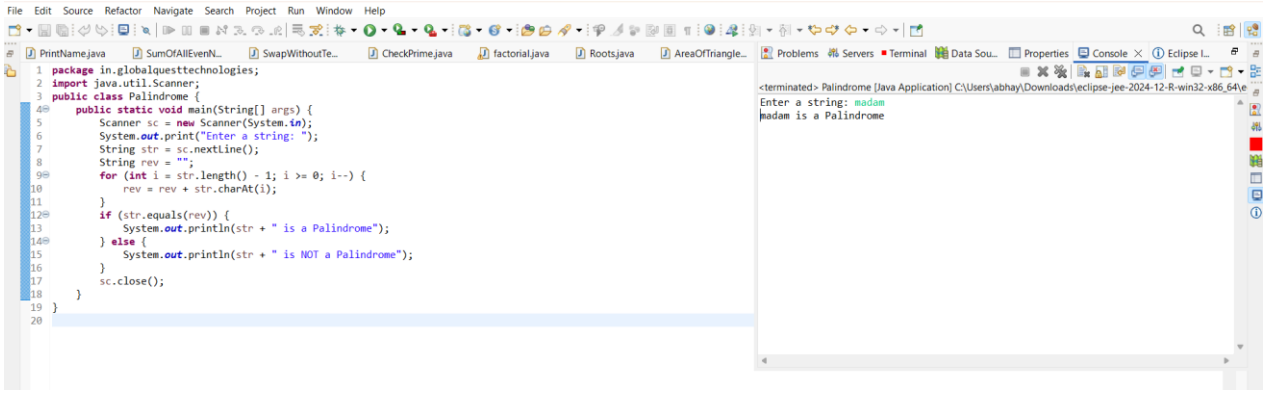
```
        System.out.println("Second largest number is: " + secondLargest);
    }
    sc.close();
}
}
```

10. Write a program to reverse a string




```
package in.globalquesttechnologies;
//import java.util.Scanner;
public class ReverseString {
public static void main(String[] args) {
        String str = "hello";
    String reversed = new StringBuilder(str).reverse().toString();
    System.out.println("Reversed string: " + reversed);
      }
}
```

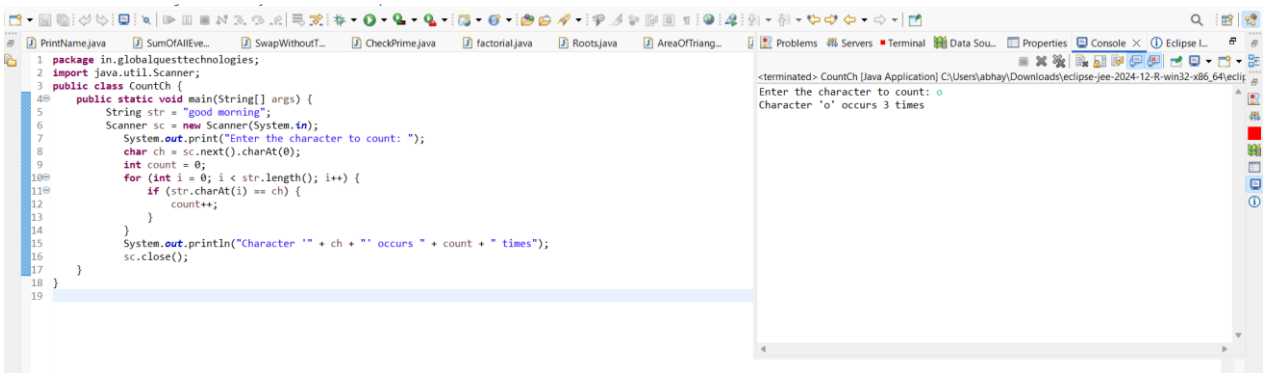
11. write a program to check if a given string is a palindrome.




```
package in.globalquesttechnologies;
import java.util.Scanner;
public class Palindrome {
      public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);
    System.out.print("Enter a string: ");
    String str = sc.nextLine();
    String rev = "";
    for (int i = str.length() - 1; i >= 0; i--) {
        rev = rev + str.charAt(i);
    }
    if (str.equals(rev)) {
        System.out.println(str + " is a Palindrome");
    } else {
        System.out.println(str + " is NOT a Palindrome");
    }
```

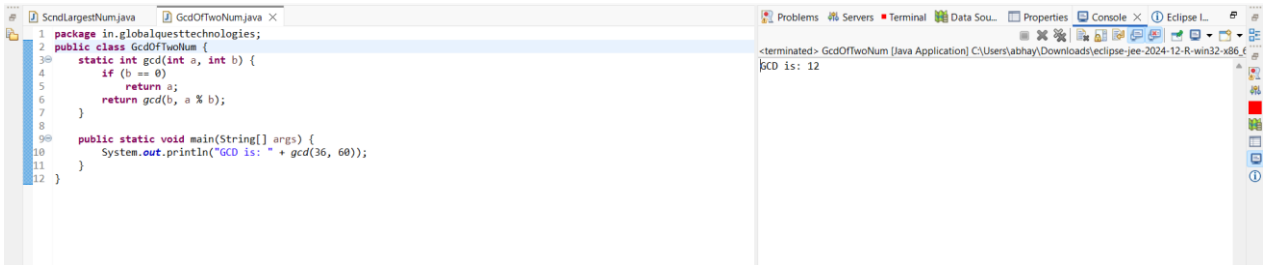
```
        sc.close();
          }
}
```

12. Write a program to count the occurrences of a character in a string




```
package in.globalquesttechnologies;
import java.util.Scanner;
public class CountCh {
        public static void main(String[] args) {
                String str = "good morning";
                Scanner sc = new Scanner(System.in);
            System.out.print("Enter the character to count: ");
            char ch = sc.next().charAt(0);
            int count = 0;
            for (int i = 0; i < str.length(); i++) {
                if (str.charAt(i) == ch) {
                    count++;
                }
            }
            System.out.println("Character '" + ch + "' occurs " + count + " times");
            sc.close();
        }
}
```

13.Write a program to find the GCD (Greatest Common Divisor) of two numbers



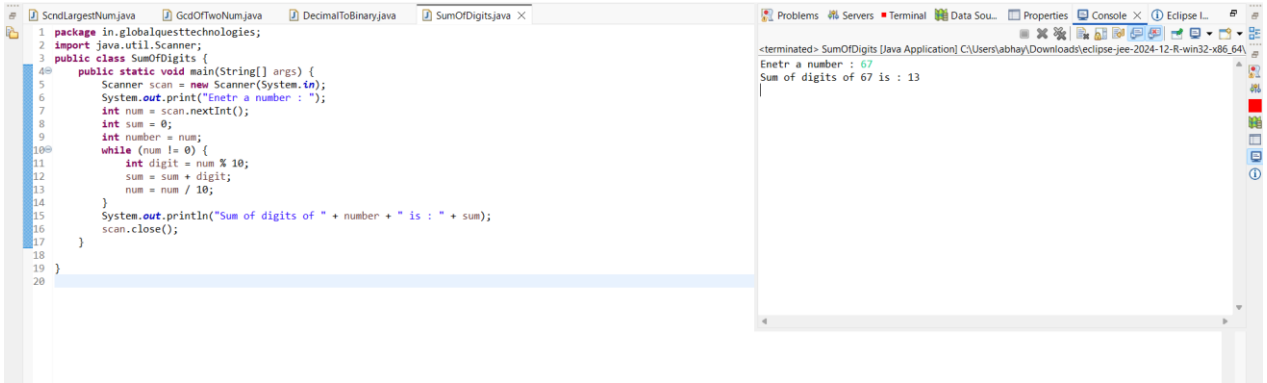

```
package in.globalquesttechnologies;
public class GcdOfTwoNum {
    static int gcd(int a, int b) {
        if (b == 0)
            return a;
        return gcd(b, a % b);
    }
```

```
    public static void main(String[] args) {
        System.out.println("GCD is: " + gcd(36, 60));
    }
}
```

14.Write a program to convert a decimal number to binary.


```
package in.globalquesttechnologies;
public class DecimalToBinary {
    public static void main(String[] args) {
          int num = 13;
        int original = num;
        String binary = "";
        if (num == 0) {
            binary = "0";
        } else {
            while (num > 0) {
                int remainder = num % 2;
                binary = remainder + binary;
                num = num / 2;
            }
        }
        System.out.println("Binary equivalent of " + original + " is: " + binary);
    }
}
```

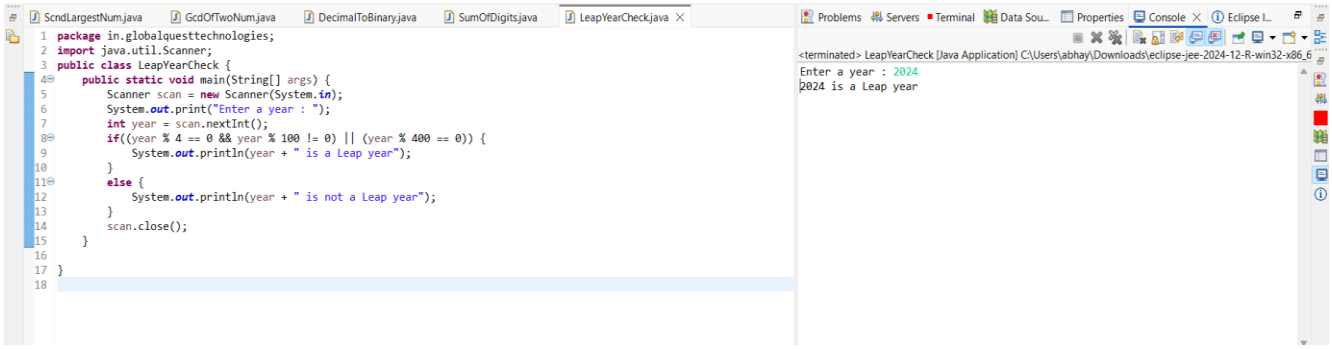
15. Write a program to calculate the sum of digits of a given number.




```
package in.globalquesttechnologies;
import java.util.Scanner;
public class SumOfDigits {
public static void main(String[] args) {
          Scanner scan = new Scanner(System.in);
          System.out.print("Enetr a number : ");
          int num = scan.nextInt();
```

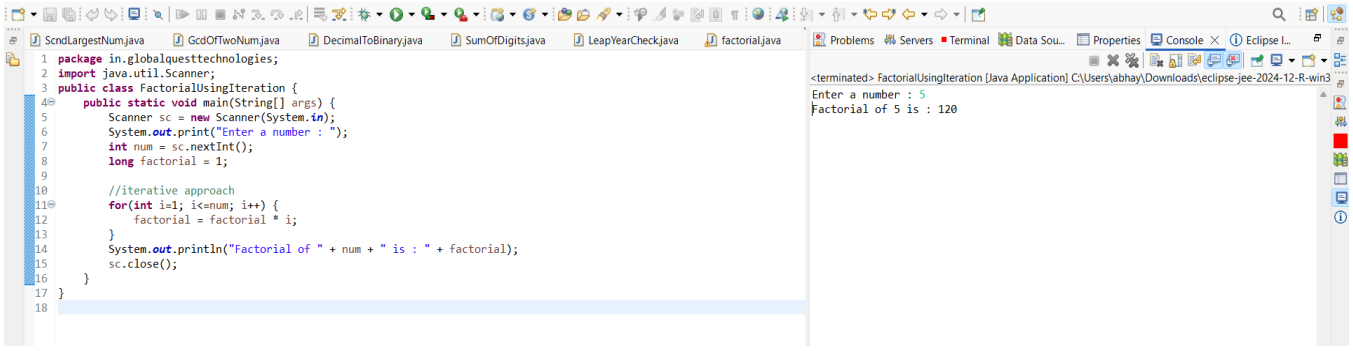
```
        int sum = 0;
        int number = num;
        while (num != 0) {
                int digit = num % 10;
                sum = sum + digit;
                num = num / 10;
        }
        System.out.println("Sum of digits of " + number + " is : " + sum);
        scan.close();
}

}
```

16.Write a program to check whether a given year is a leap year or not.



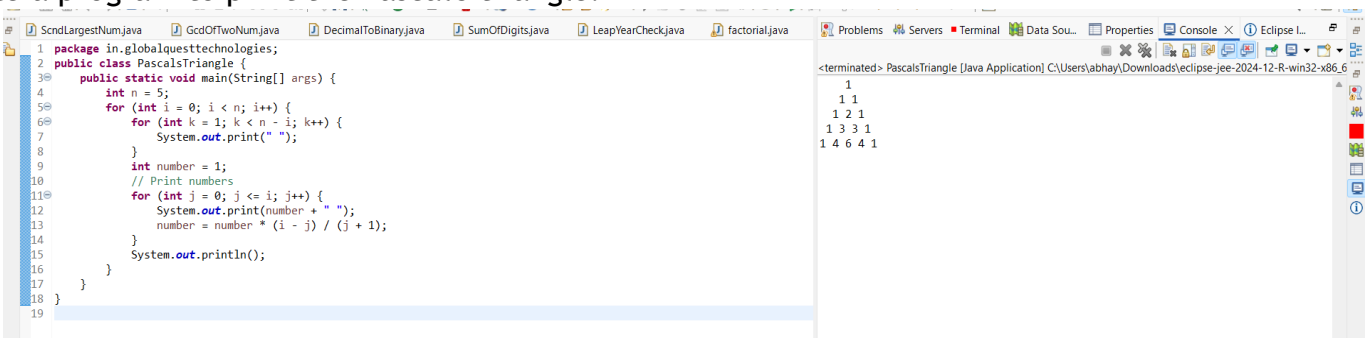

```
package in.globalquesttechnologies;
import java.util.Scanner;
public class LeapYearCheck {
public static void main(String[] args) {
        Scanner scan = new Scanner(System.in);
        System.out.print("Enter a year : ");
        int year = scan.nextInt();
        if((year % 4 == 0 && year % 100 != 0) || (year % 400 == 0)) {
                System.out.println(year + " is a Leap year");
        }
        else {
                System.out.println(year + " is not a Leap year");
        }
        scan.close();
}
}
```

17.Writea program to find the factorial of a number using iteration.



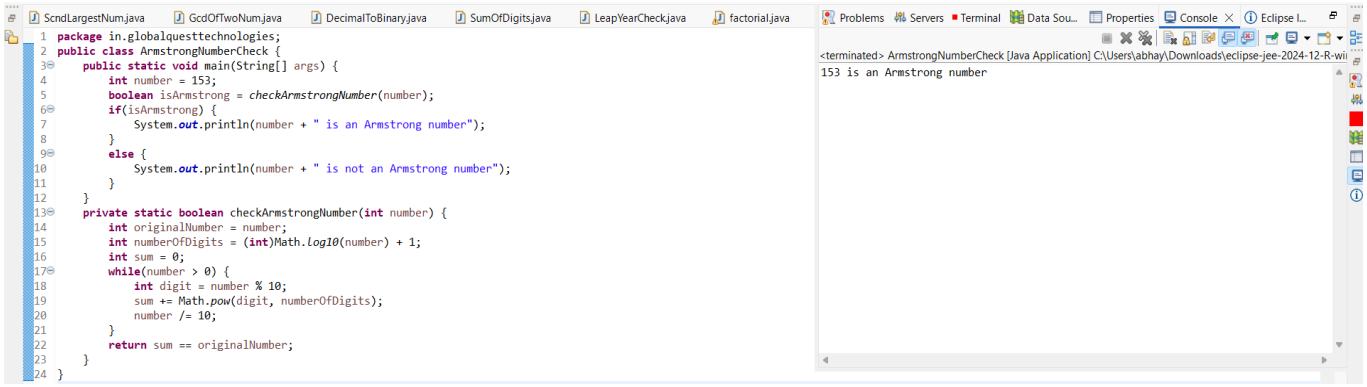
```
package in.globalquesttechnologies;
import java.util.Scanner;
public class FactorialUsingIteration {
	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);
		System.out.print("Enter a number : ");
		int num = sc.nextInt();
		long factorial = 1;

		//iterative approach
		for(int i=1; i<=num; i++) {
			factorial = factorial * i;
		}
		System.out.println("Factorial of " + num + " is : " + factorial);
		sc.close();
	}
}
```

18. Write a program to print the Pascal's triangle.



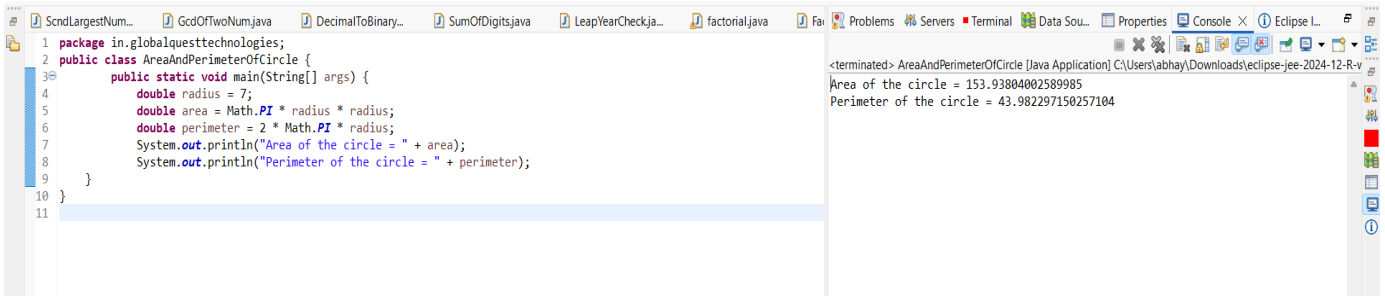

```
package in.globalquesttechnologies;
public class PascalsTriangle {
   public static void main(String[] args) {
        int n = 5;
      for (int i = 0; i < n; i++) {
         for (int k = 1; k < n - i; k++) {
            System.out.print(" ");
         }
         int number = 1;
         // Print numbers
         for (int j = 0; j <= i; j++) {
            System.out.print(number + " ");
            number = number * (i - j) / (j + 1);
         }
         System.out.println();
      }
   }
}
```

19. Write a program to check if a number is Armstrong or not.




```
package in.globalquesttechnologies;
public class ArmstrongNumberCheck {
	public static void main(String[] args) {
		int number = 153;
		boolean isArmstrong = checkArmstrongNumber(number);
		if(isArmstrong) {
			System.out.println(number + " is an Armstrong number");
		}
		else {
			System.out.println(number + " is not an Armstrong number");
		}
	}
	private static boolean checkArmstrongNumber(int number) {
		int originalNumber = number;
		int numberOfDigits = (int)Math.log10(number) + 1;
		int sum = 0;
		while(number > 0) {
			int digit = number % 10;
			sum += Math.pow(digit, numberOfDigits);
			number /= 10;
		}
		return sum == originalNumber;
	}
}
```

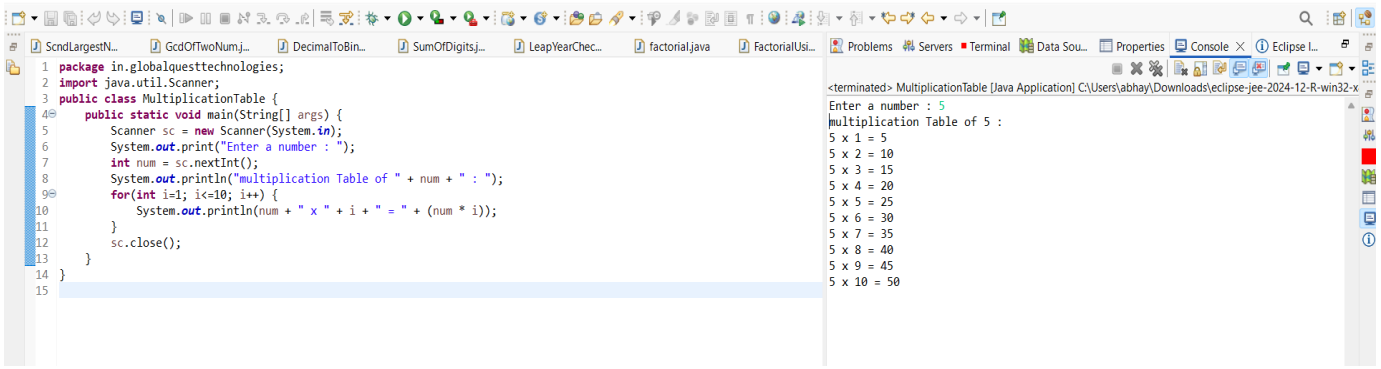
20. Write a program to find the area and perimeter of a circle.




```
package in.globalquesttechnologies;
public class AreaAndPerimeterOfCircle {
	public static void main(String[] args) {
		double radius = 7;
	double area = Math.PI * radius * radius;
	double perimeter = 2 * Math.PI * radius;
```

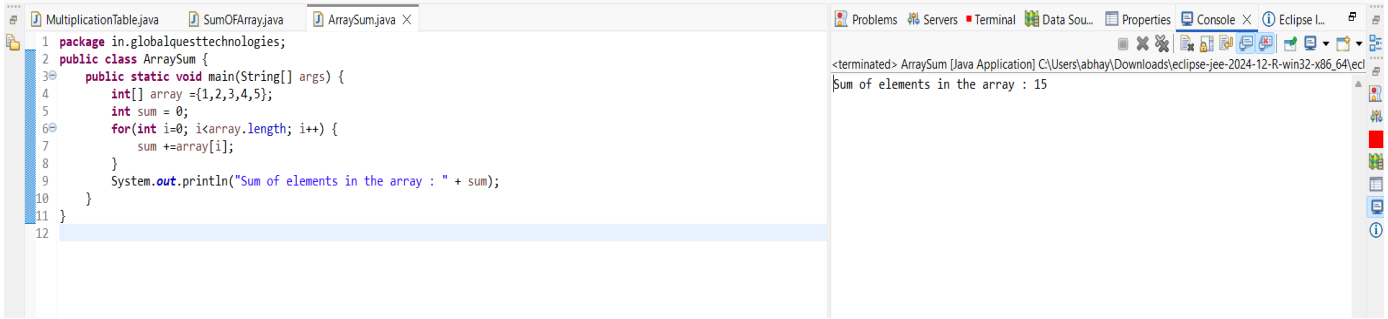
```
        System.out.println("Area of the circle = " + area);
        System.out.println("Perimeter of the circle = " + perimeter);
}
}
```

21.Write a program to print the multiplication table of a given number.



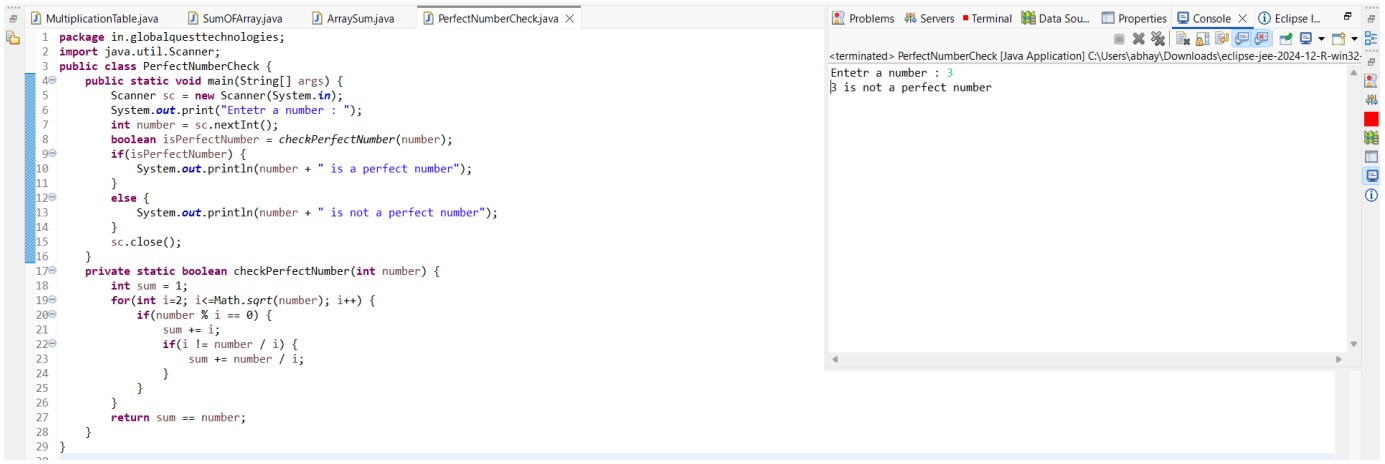

```
package in.globalquesttechnologies;
import java.util.Scanner;
public class MultiplicationTable {
        public static void main(String[] args) {
                Scanner sc = new Scanner(System.in);
                System.out.print("Enter a number : ");
                int num = sc.nextInt();
                System.out.println("multiplication Table of " + num + " : ");
                for(int i=1; i<=10; i++) {
                        System.out.println(num + " x " + i + " = " + (num * i));
                }
                sc.close();
        }
}
```

22.Write a program to find the sum of all elements in an array.



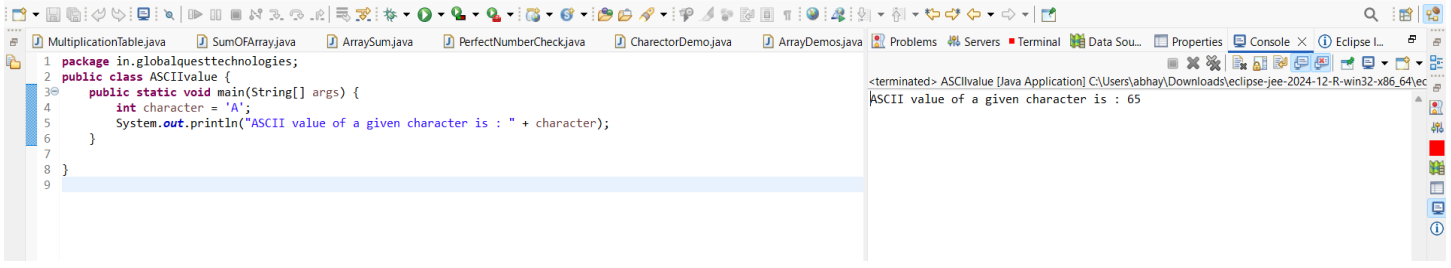

```
package in.globalquesttechnologies;
public class ArraySum {
        public static void main(String[] args) {
                int[] array ={1,2,3,4,5};
                int sum = 0;
                for(int i=0; i<array.length; i++) {
                        sum +=array[i];
                }
                System.out.println("Sum of elements in the array : " + sum);
        }
}
```

23.Write a program to check if a given number is a perfect number.



```
package in.globalquesttechnologies;
import java.util.Scanner;
public class PerfectNumberCheck {
	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);
		System.out.print("Entetr a number : ");
		int number = sc.nextInt();
		boolean isPerfectNumber = checkPerfectNumber(number);
		if(isPerfectNumber) {
			System.out.println(number + " is a perfect number");
		}
		else {
			System.out.println(number + " is not a perfect number");
		}
		sc.close();
	}
	private static boolean checkPerfectNumber(int number) {
		int sum = 1;
		for(int i=2; i<=Math.sqrt(number); i++) {
			if(number % i == 0) {
				sum += i;
				if(i != number / i) {
					sum += number / i;
				}
			}
		}
		return sum == number;
	}
}
```

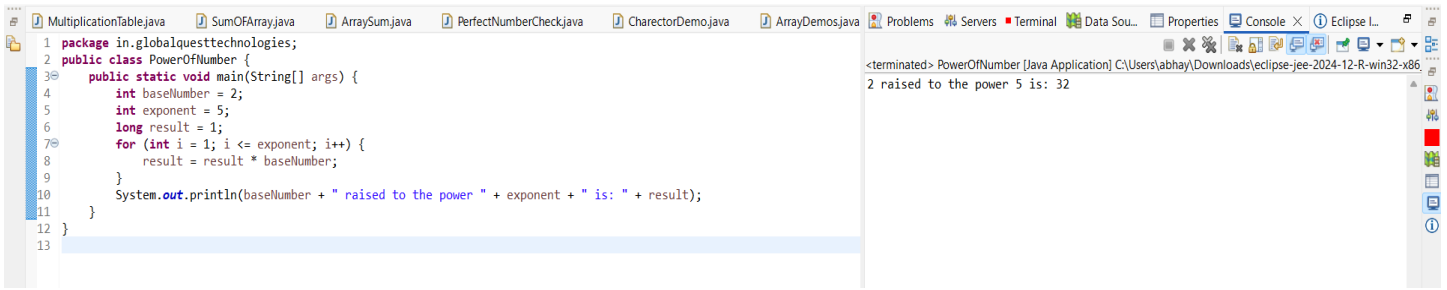
24. Write a program to find the ASCII value of a character.



```
package in.globalquesttechnologies;
public class ASCIIvalue {
	public static void main(String[] args) {
		int character = 'A';
		System.out.println("ASCII value of a given character is : " + character);
	}

}
```

```
package in.globalquesttechnologies;
public class ASCIIvalue {
	public static void main(String[] args) {
		int character = 'A';
		System.out.println("ASCII value of a given character is : " + character);
	}
}
```

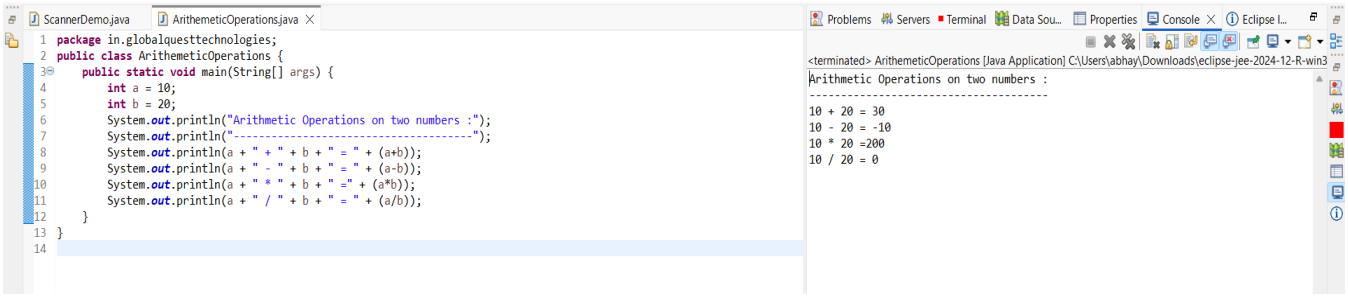
25.Write a program to calculate the power of a number.




```
package in.globalquesttechnologies;
public class PowerOfNumber {
    public static void main(String[] args) {
        int baseNumber = 2;
        int exponent = 5;
        long result = 1;
        for (int i = 1; i <= exponent; i++) {
            result = result * baseNumber;
        }
        System.out.println(baseNumber + " raised to the power " + exponent + " is: " + result);
    }
}
```

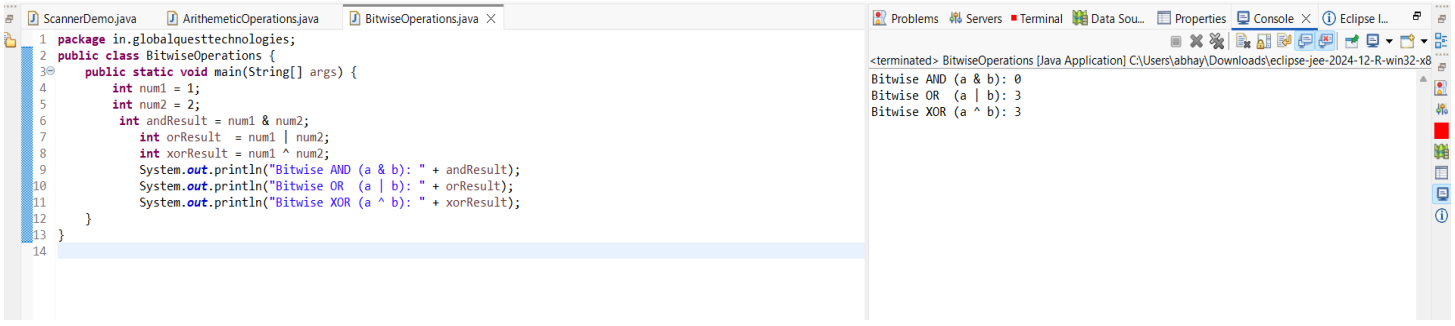
operators

1. Write a program to perform arithmetic operations (+, -, *, /) on two numbers.



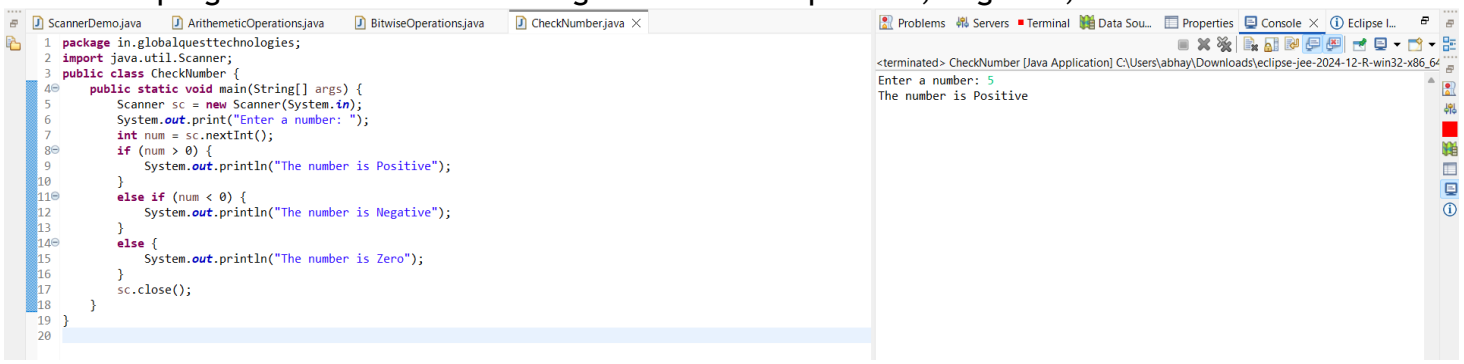

```
package in.globalquesttechnologies;
public class ArithemeticOperations {
	public static void main(String[] args) {
		int a = 10;
		int b = 20;
		System.out.println("Arithmetic Operations on two numbers :");
		System.out.println("-------------------------------------");
		System.out.println(a + " + " + b + " = " + (a+b));
	    System.out.println(a + " - " + b + " = " + (a-b));
	    System.out.println(a + " * " + b + " =" + (a*b));
	    System.out.println(a + " / " + b + " = " + (a/b));
	}
}
```

2. Write a program to perform bitwise AND, OR, and XOR operations on two integers.



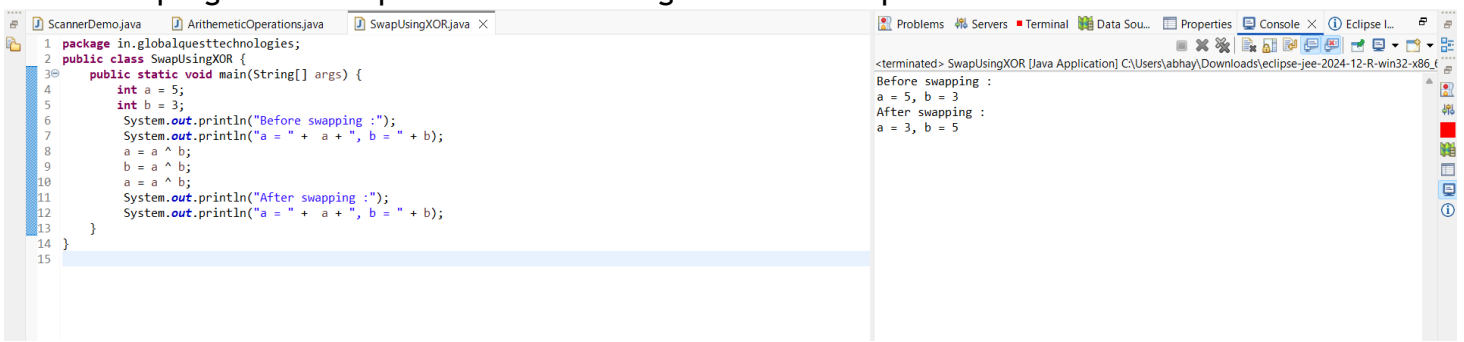

```
package in.globalquesttechnologies;
public class BitwiseOperations {
	public static void main(String[] args) {
		int num1 = 1;
		int num2 = 2;
		 int andResult = num1 & num2;
	int orResult  = num1 | num2;
	int xorResult = num1 ^ num2;
	System.out.println("Bitwise AND (a & b): " + andResult);
	System.out.println("Bitwise OR  (a | b): " + orResult);
	System.out.println("Bitwise XOR (a ^ b): " + xorResult);
	}
}
```

3. Write a program to check whether a given number is positive, negative, or zero.




```
package in.globalquesttechnologies;
import java.util.Scanner;
public class CheckNumber {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter a number: ");
        int num = sc.nextInt();
        if (num > 0) {
            System.out.println("The number is Positive");
        }
        else if (num < 0) {
            System.out.println("The number is Negative");
        }
        else {
            System.out.println("The number is Zero");
        }
        sc.close();
    }
}
```

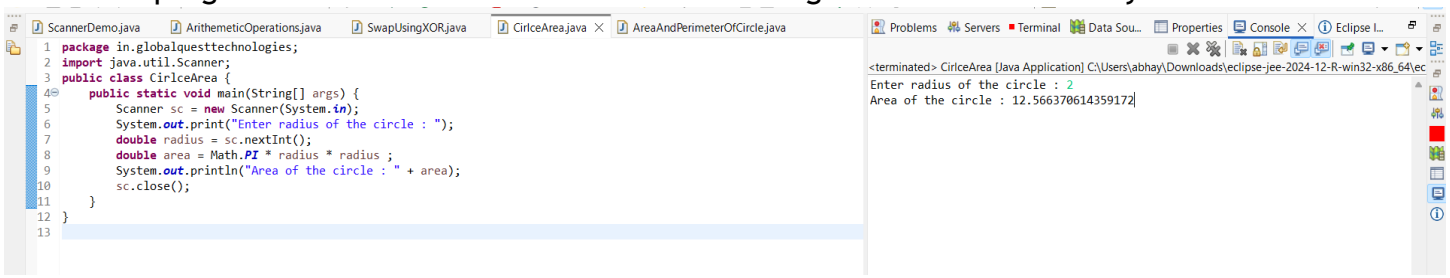
4. Write a program to swap two numbers using bitwise XOR operator.




```
package in.globalquesttechnologies;
public class SwapUsingXOR {
        public static void main(String[] args) {
                int a = 5;
                int b = 3;
                 System.out.println("Before swapping :");
                 System.out.println("a = " +  a + ", b = " + b);
                 a = a ^ b;
                 b = a ^ b;
                 a = a ^ b;
                 System.out.println("After swapping :");
                 System.out.println("a = " +  a + ", b = " + b);
```

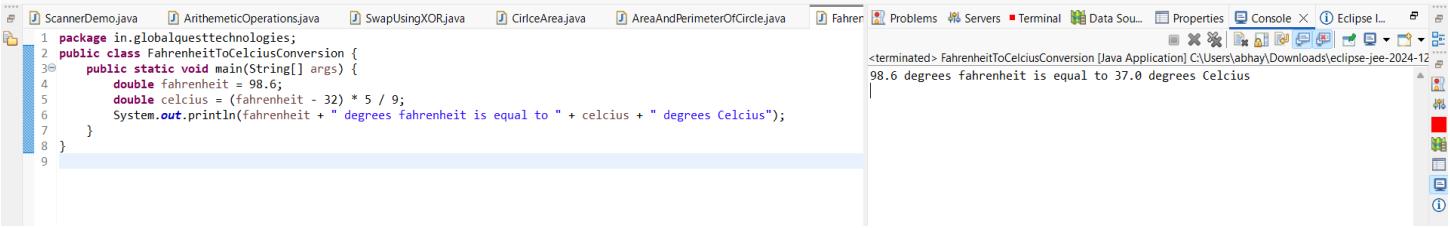
```
	}
}
```

5. Write a program to calculate the area of a circle using the radius entered by the user.



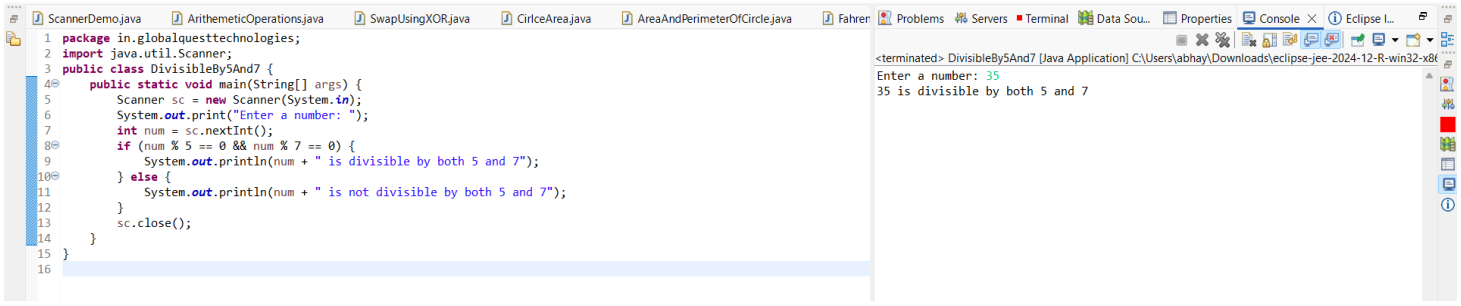

```
package in.globalquesttechnologies;
import java.util.Scanner;
public class CirlceArea {
	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);
		System.out.print("Enter radius of the circle : ");
		double radius = sc.nextInt();
		double area = Math.PI * radius * radius ;
		System.out.println("Area of the circle : " + area);
		sc.close();
	}
}
```

6. Write a program to convert temperature from Fahrenheit to Celsius.



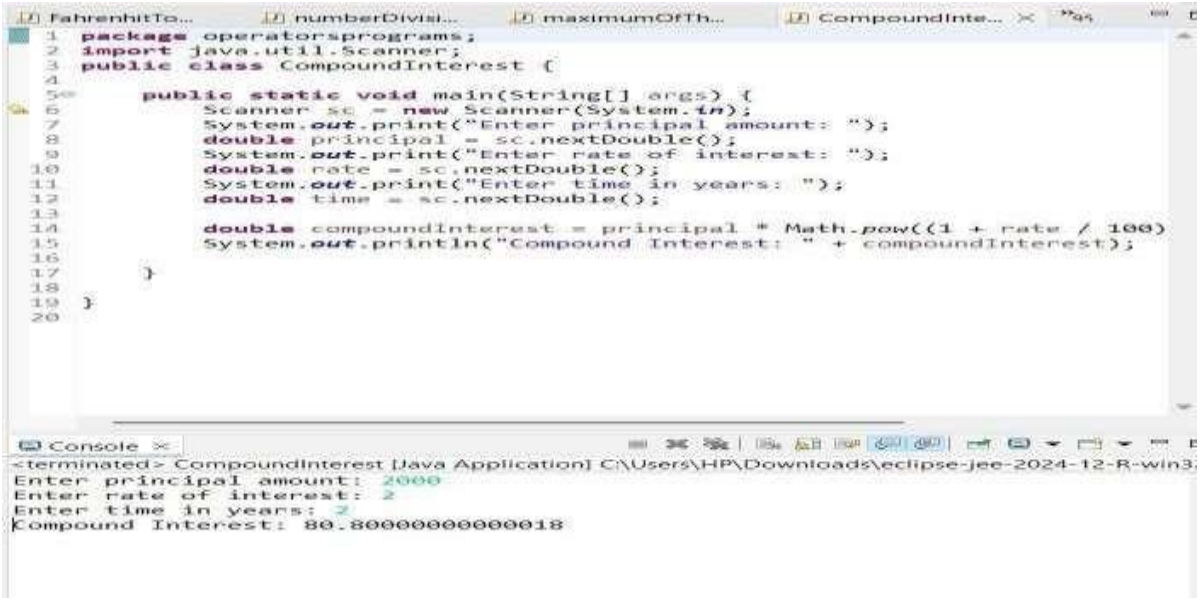

```
package in.globalquesttechnologies;
public class FahrenheitToCelciusConversion {
	public static void main(String[] args) {
		double fahrenheit = 98.6;
		double celcius = (fahrenheit - 32) * 5 / 9;
		System.out.println(fahrenheit + " degrees fahrenheit is equal to " + celcius + "
degrees Celcius");
	}
}
```

7. Write a program to check if a given number is divisible by both 5 and 7.



```
package in.globalquesttechnologies;
import java.util.Scanner;
public class DivisibleBy5And7 {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter a number: ");
        int num = sc.nextInt();
        if (num % 5 == 0 && num % 7 == 0) {
            System.out.println(num + " is divisible by both 5 and 7");
        } else {
            System.out.println(num + " is not divisible by both 5 and 7");
        }
        sc.close();
    }
}
```

8. Write a program to calculate the compound interest.



9. Write a program to check whether a given character is a vowel or consonant.

```java
package operatorsprograms;
import java.util.Scanner;
public class vowelOrConsonent {

    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter a character: ");
        char ch = sc.next().charAt(0);

        if (ch == 'a' || ch == 'e' || ch == 'i' || ch == 'o' || ch == '
            ch == 'A' || ch == 'E' || ch == 'I' || ch == 'O' || ch == '
            System.out.println("The character is a vowel.");
        } else {
            System.out.println("The character is a consonant.");
        }

    }

}
```

```
<terminated> vowelOrConsonent [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32
Enter a character: 1
The character is a consonant.
```

10. Write a program to find the maximum of three numbers using conditional operator.

```java
package operatorsprograms;
import java.util.Scanner;
public class maximumOfThreeNumbers {

    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
            System.out.print("Enter first number: ");
            int num1 = sc.nextInt();
            System.out.print("Enter second number: ");
            int num2 = sc.nextInt();
            System.out.print("Enter third number: ");
            int num3 = sc.nextInt();

            int max = (num1 > num2) ? (num1 > num3 ? num1 : num3) : (nu
            System.out.println("The maximum number is: " + max);

    }

}
```

```
<terminated> maximumOfThreeNumbers [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024
Enter first number: 30
Enter second number: 34
Enter third number:
5000
The maximum number is: 5000
```

11. Write a program to find the sum of digits of a number using while loop.

```java
package operatorsprograms;
import java.util.Scanner;
public class sumOfDigitsUsingWhile {

    public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);
             System.out.print("Enter a number: ");
             int num = sc.nextInt();

             int sum = 0;
             while (num != 0) {
                 sum += num % 10;
                 num /= 10;
             }
             System.out.println("Sum of digits: " + sum);
    }

}

```

```
Console ×
<terminated> sumOfDigitsUsingWhile [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-wi
Enter a number: 234566788
Sum of digits: 49
```

12. Write a program to check whether a given number is palindrome or not using recursion.

```java
package practiseprograms;
import java.util.Scanner;
public class palindromOfNumber {

    static int reverse(int num, int rev) {
        if (num == 0) {
            return rev;
        }
        rev = rev * 10 + num % 10;
        return reverse(num / 10, rev);
    }

    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter a number: ");
        int num = sc.nextInt();
        int reversedNum = reverse(num, 0);

        if (num == reversedNum) {
            System.out.println("The number is a palindrome.");
        } else {
            System.out.println("The number is not a palindrome.");
        }
    }
}

```

```
Console ×
<terminated> palindromOfNumber [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-
Enter a number: 456
The number is not a palindrome.
```

13. Write a program to check whether a given number is prime or not using for loop.

```java
package practiseprograms;

import java.util.Scanner;

public class primenumber {

    public static void main(String[] args) {
        Scanner sc=new Scanner(System.in);
        System.out.println("enter the number");
        int number=sc.nextInt();
        for(int i=0;i<=number;i++) {
                if(number%2!=0&&number%3!=0) {
                    System.out.println("is  a prime number");

                }
                else {
                    System.out.println(" not a prime");
                }
            }
        }

    }
```

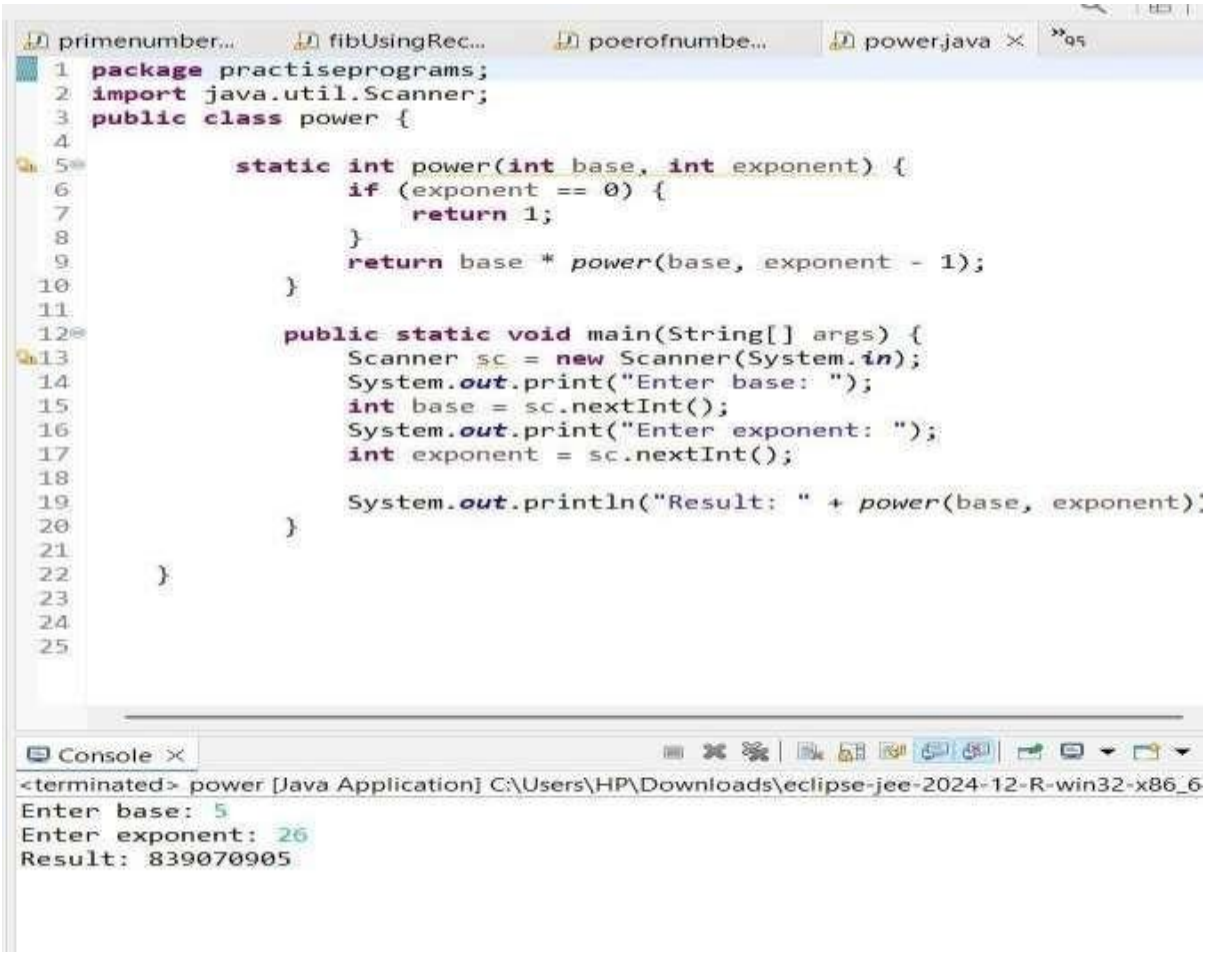
```
<terminated> primenumber [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32
enter the number
7
is  a prime number
```

14. Write a program to find the factorial of a number using recursion.

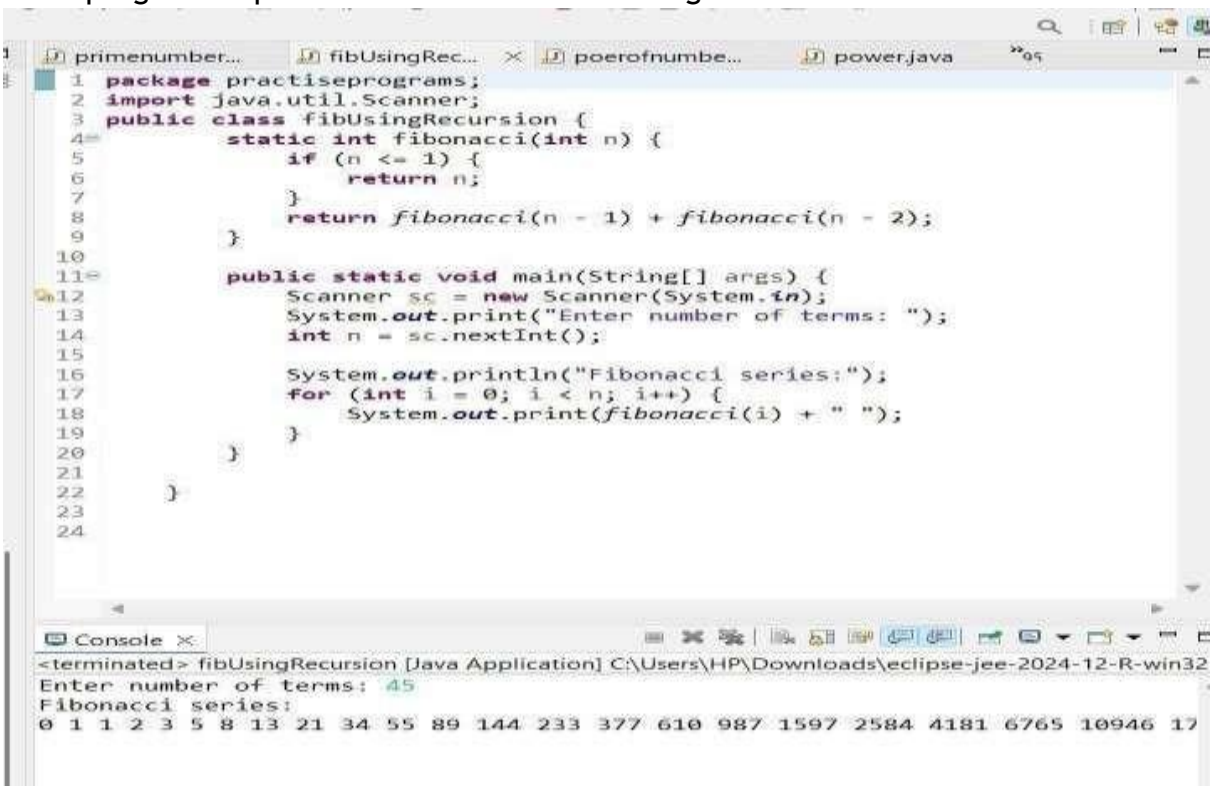
```java
package practiseprograms;
import java.util.Scanner;
public class fibUsingRecursion {
        static int fibonacci(int n) {
            if (n <= 1) {
                return n;
            }
            return fibonacci(n - 1) + fibonacci(n - 2);
        }

        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);
            System.out.print("Enter number of terms: ");
            int n = sc.nextInt();

            System.out.println("Fibonacci series:");
            for (int i = 0; i < n; i++) {
                System.out.print(fibonacci(i) + " ");
            }
        }

    }
```

```
<terminated> fibUsingRecursion [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R
Enter number of terms: 20
Fibonacci series:
0 1 1 2 3 5 8 13 21 34 55 89 144 233 377 610 987 1597 2584 4181
```

15. Write a program to calculate the power of a number using recursion.



16. Write a program to print the Fibonacci series using recursion



17. Write a program to reverse a string using recursion.

```java
package practiseprograms;
import java.util.Scanner;
public class ReversiveOfString {
        static String reverse(String str) {
            if (str.isEmpty()) {
                return str;
            }
            return reverse(str.substring(1)) + str.charAt(0);
        }

        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);
            System.out.print("Enter a string: ");
            String str = sc.nextLine();

            System.out.println("Reversed string: " + reverse(str));
        }

    }
```

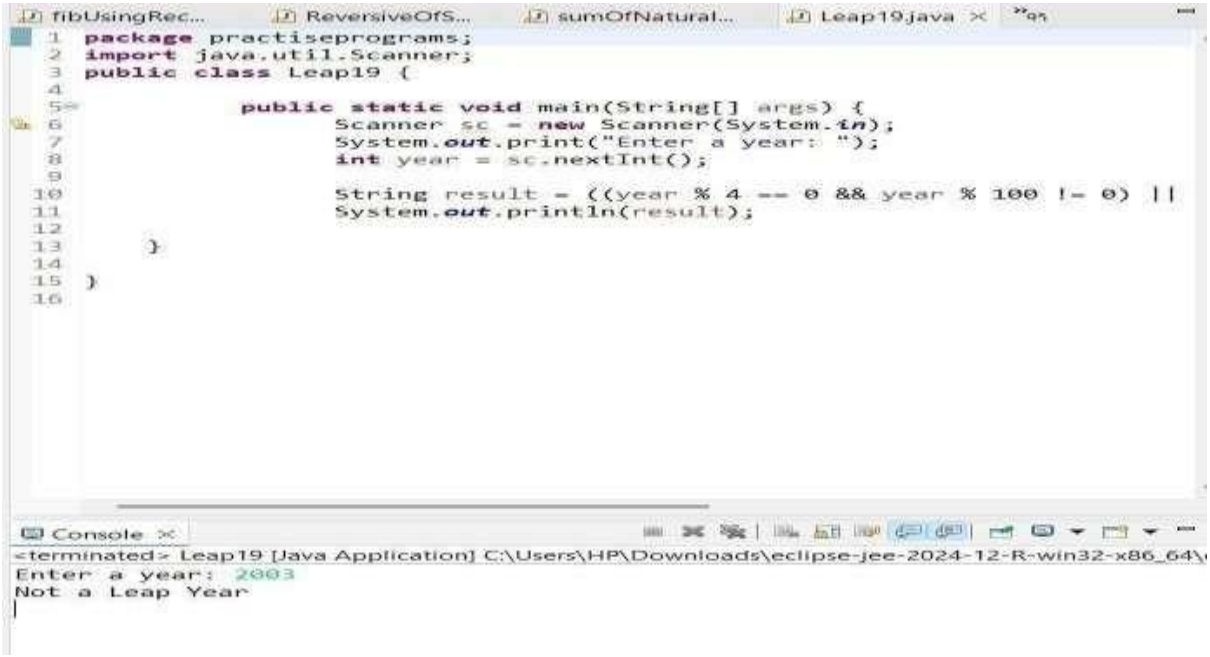
```
<terminated> ReversiveOfString [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win3
Enter a string: ammu
Reversed string: umma
```

18. Write a program to calculate the sum of natural numbers up to a given term

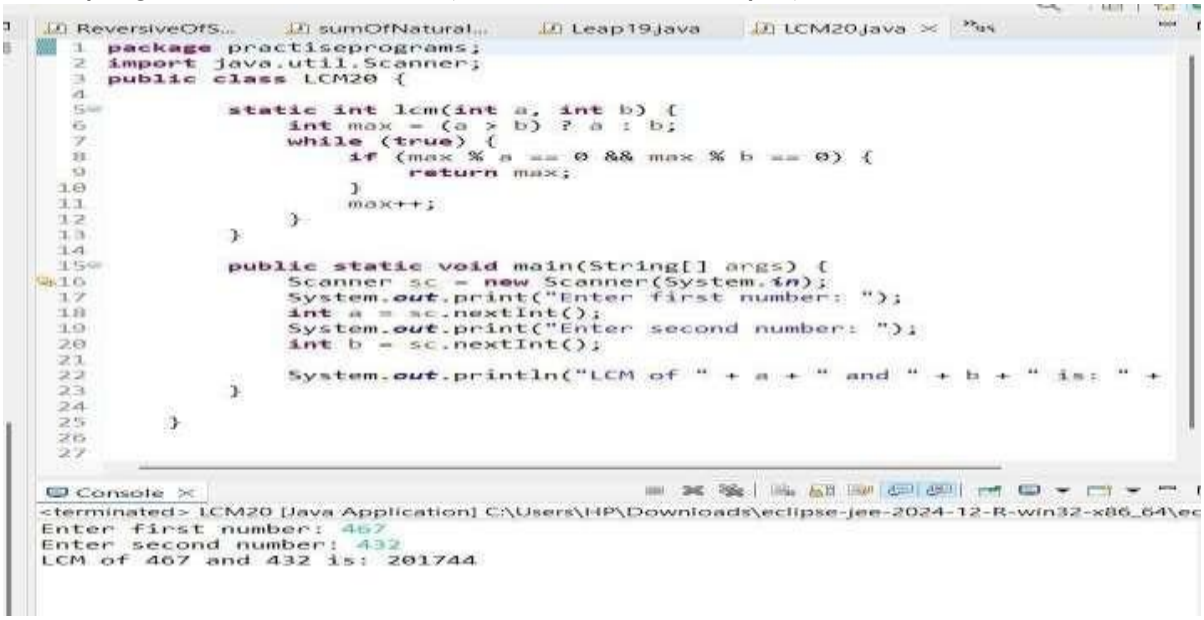
```java
package practiseprograms;
import java.util.Scanner;
public class sumOfNatural {

      static int sum(int n) {
            if (n == 1) {
                return 1;
            }
            return n + sum(n - 1);
        }

        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);
            System.out.print("Enter a number: ");
            int n = sc.nextInt();

            System.out.println("Sum of first " + n + " natural numbers:
        }
}
```

```
<terminated> sumOfNatural [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x8
Enter a number: 50
Sum of first 50 natural numbers: 1275
```

19. Write a program to check whether a given year is leap year or not using conditional operator



20. Write a program to find the LCM (Least Common Multiple) of two numbers.



21. Write a program to calculate the area of a triangle using Heron's formula

```java
package practiseprograms;
import java.util.Scanner;
public class Herons {

	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);
		System.out.print("Enter first side: ");
		double a = sc.nextDouble();
		System.out.print("Enter second side: ");
		double b = sc.nextDouble();
		System.out.print("Enter third side: ");
		double c = sc.nextDouble();

		double s = (a + b + c) / 2;
		double area = Math.sqrt(s * (s - a) * (s - b) * (s - c)

		System.out.println("Area of the triangle: " + area);
	}

}
```

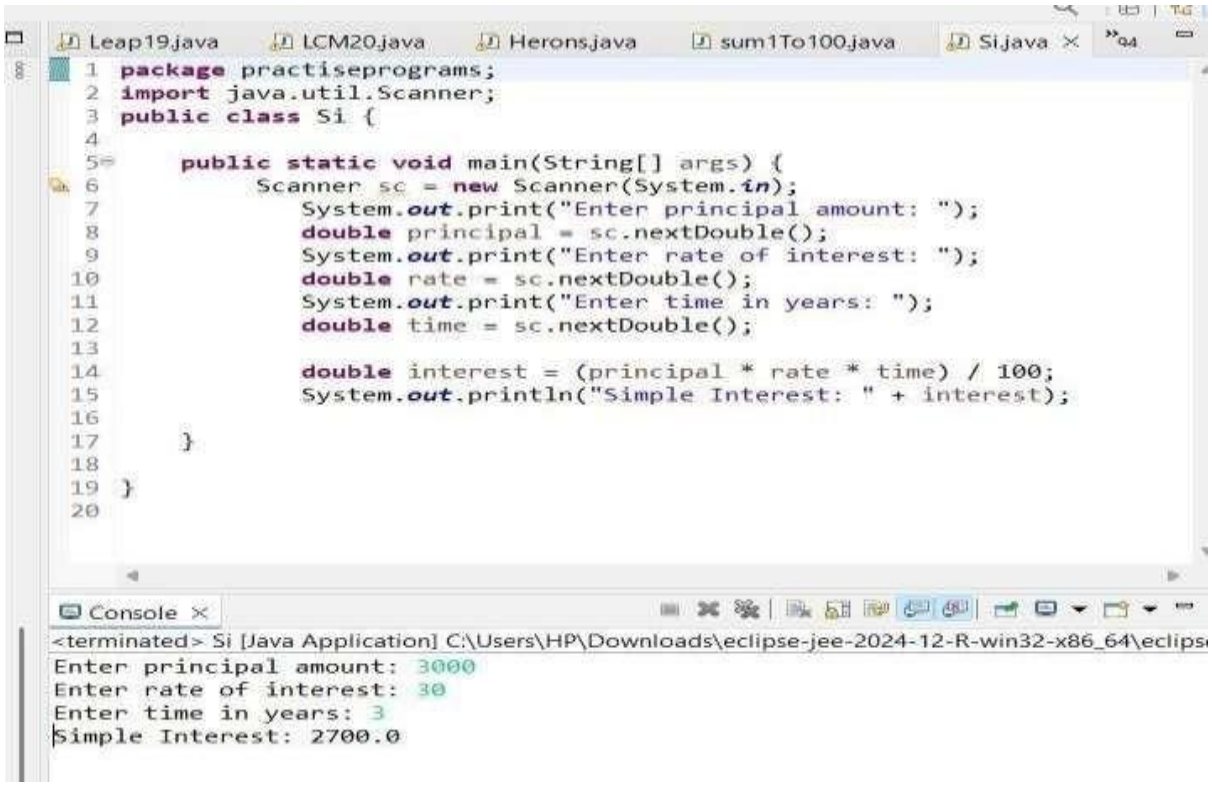
```
<terminated> Herons [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64
Enter first side: 36
Enter second side: 42
Enter third side: 12
Area of the triangle: 200.2373591515829
```

22. Write a program to find the sum of all even numbers between 1 to 100 using for loop.

```java
package practiseprograms;

public class sum1To100 {

	public static void main(String[] args) {
		int sum = 0;
		for (int i = 1; i <= 100; i++) {
			if (i % 2 == 0) {
				sum += i;
			}
		}
		System.out.println("Sum of all even numbers between 1 t
	}

}
```

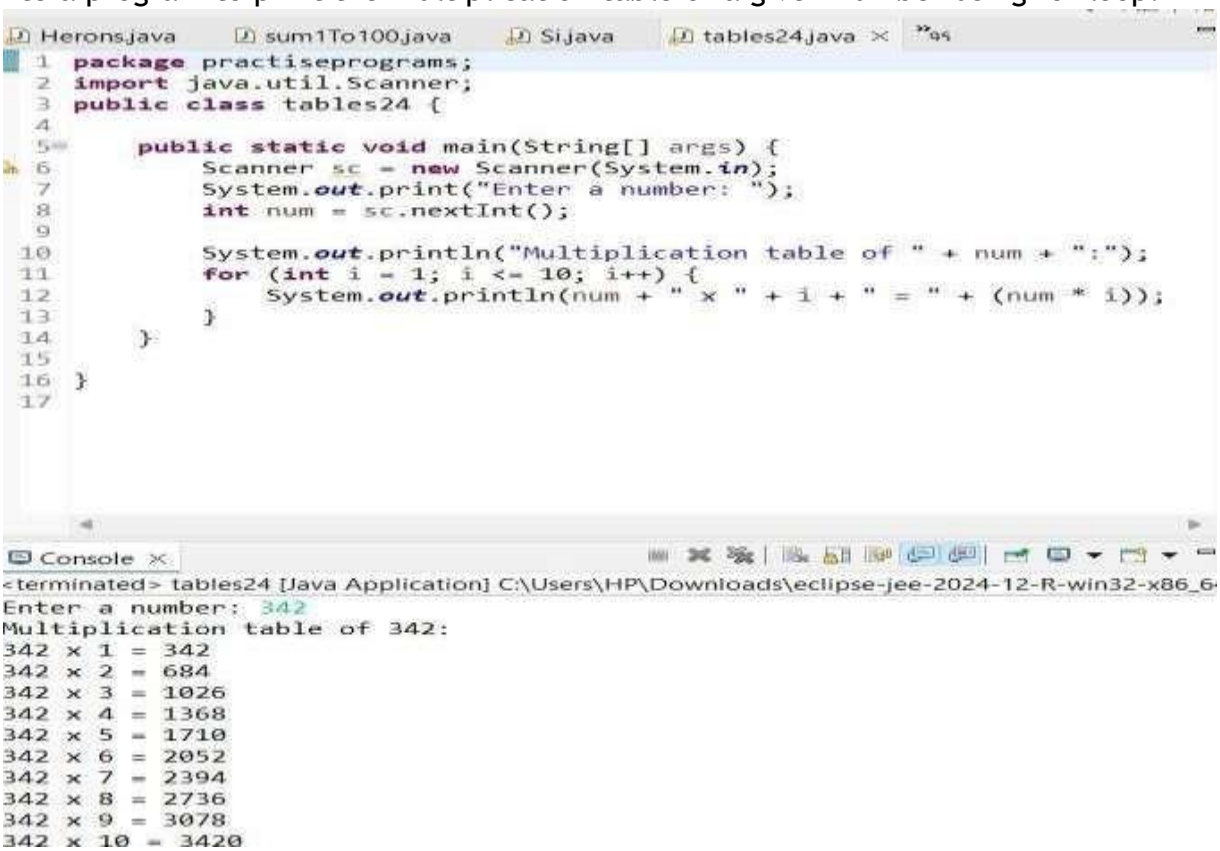
```
<terminated> sum1To100 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86
Sum of all even numbers between 1 to 100: 2550
```

23. Write a program to calculate the simple interest.



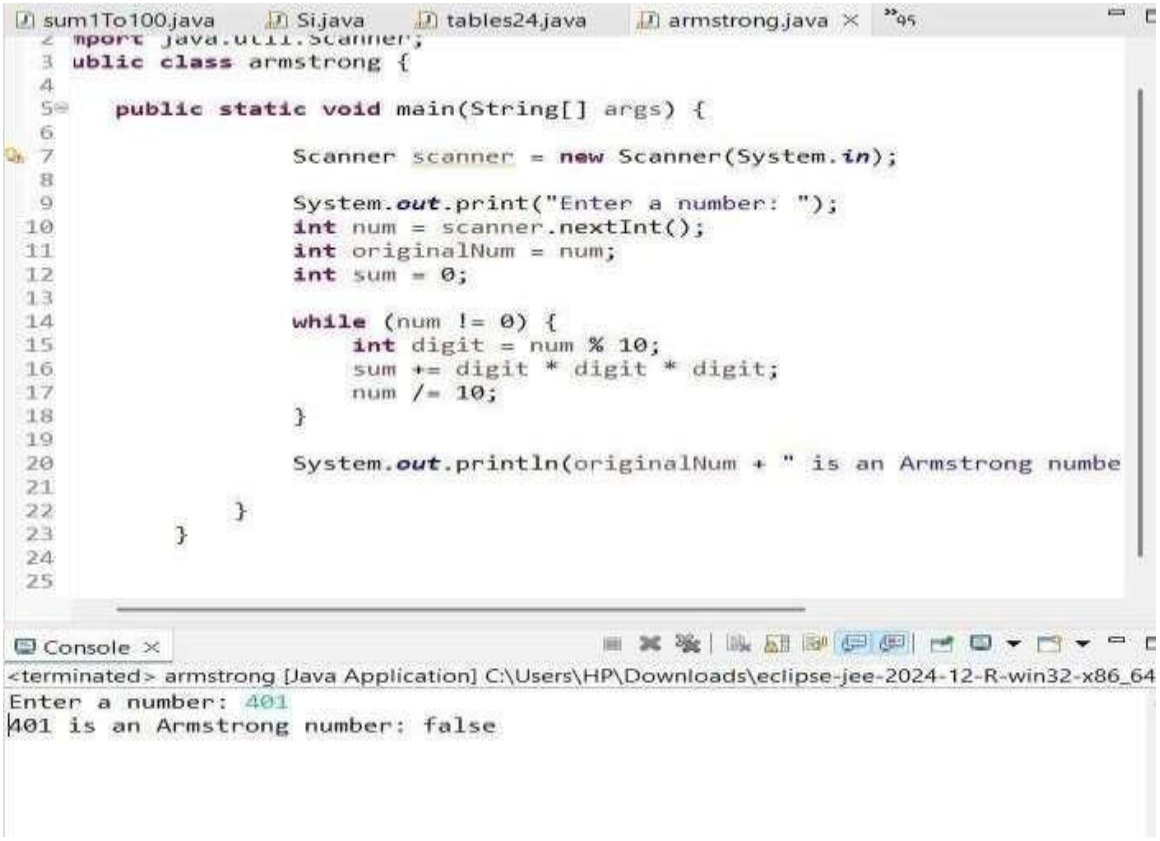
```
Leap19.java  LCM20.java  Heronsjava  sum1To100.java  Si.java

1  package practiseprograms;
2  import java.util.Scanner;
3  public class Si {
4
5      public static void main(String[] args) {
6          Scanner sc = new Scanner(System.in);
7              System.out.print("Enter principal amount: ");
8              double principal = sc.nextDouble();
9              System.out.print("Enter rate of interest: ");
10             double rate = sc.nextDouble();
11             System.out.print("Enter time in years: ");
12             double time = sc.nextDouble();
13
14             double interest = (principal * rate * time) / 100;
15             System.out.println("Simple Interest: " + interest);
16
17     }
18
19 }
20

Console
<terminated> Si [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\eclips
Enter principal amount: 3000
Enter rate of interest: 30
Enter time in years: 3
Simple Interest: 2700.0
```

24. Write a program to print the multiplication table of a given number using for loop.



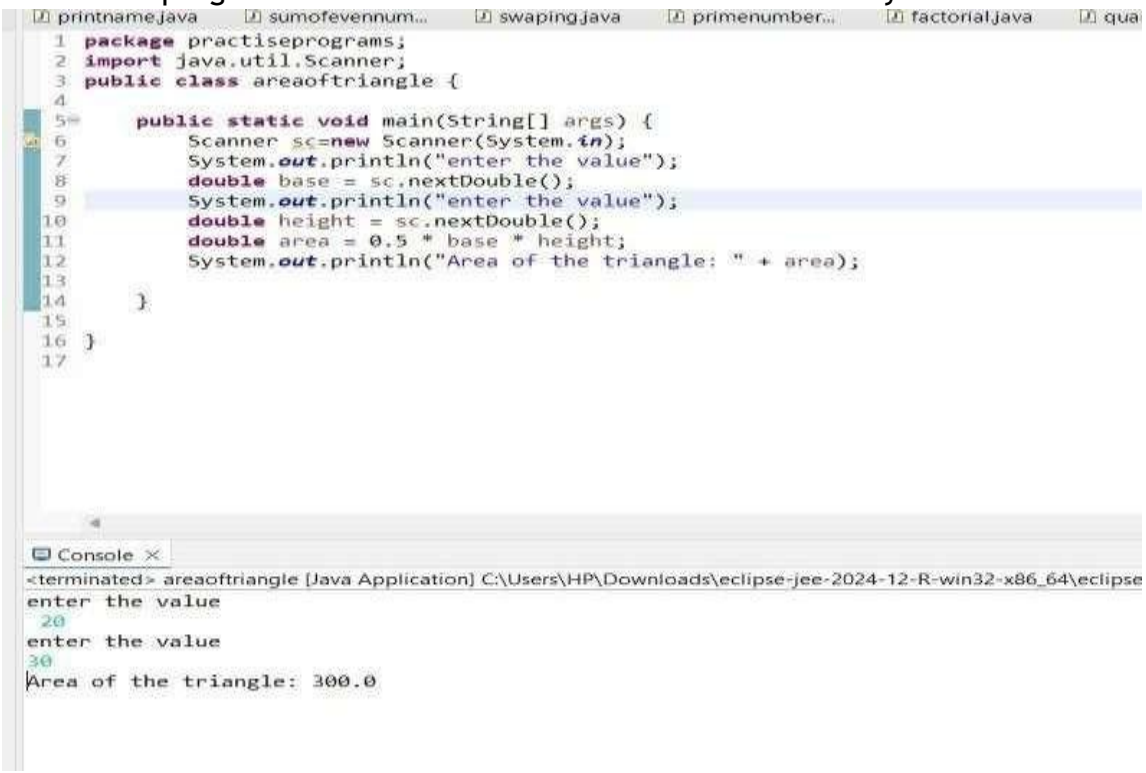
```
Heronsjava  sum1To100.java  Si.java  tables24.java

1  package practiseprograms;
2  import java.util.Scanner;
3  public class tables24 {
4
5      public static void main(String[] args) {
6          Scanner sc = new Scanner(System.in);
7          System.out.print("Enter a number: ");
8          int num = sc.nextInt();
9
10         System.out.println("Multiplication table of " + num + ":");
11         for (int i = 1; i <= 10; i++) {
12             System.out.println(num + " x " + i + " = " + (num * i));
13         }
14     }
15
16 }
17

Console
<terminated> tables24 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_6
Enter a number: 342
Multiplication table of 342:
342 x 1 = 342
342 x 2 = 684
342 x 3 = 1026
342 x 4 = 1368
342 x 5 = 1710
342 x 6 = 2052
342 x 7 = 2394
342 x 8 = 2736
342 x 9 = 3078
342 x 10 = 3420
```

25. Write a program to check whether a given number is Armstrong or not using while loop.

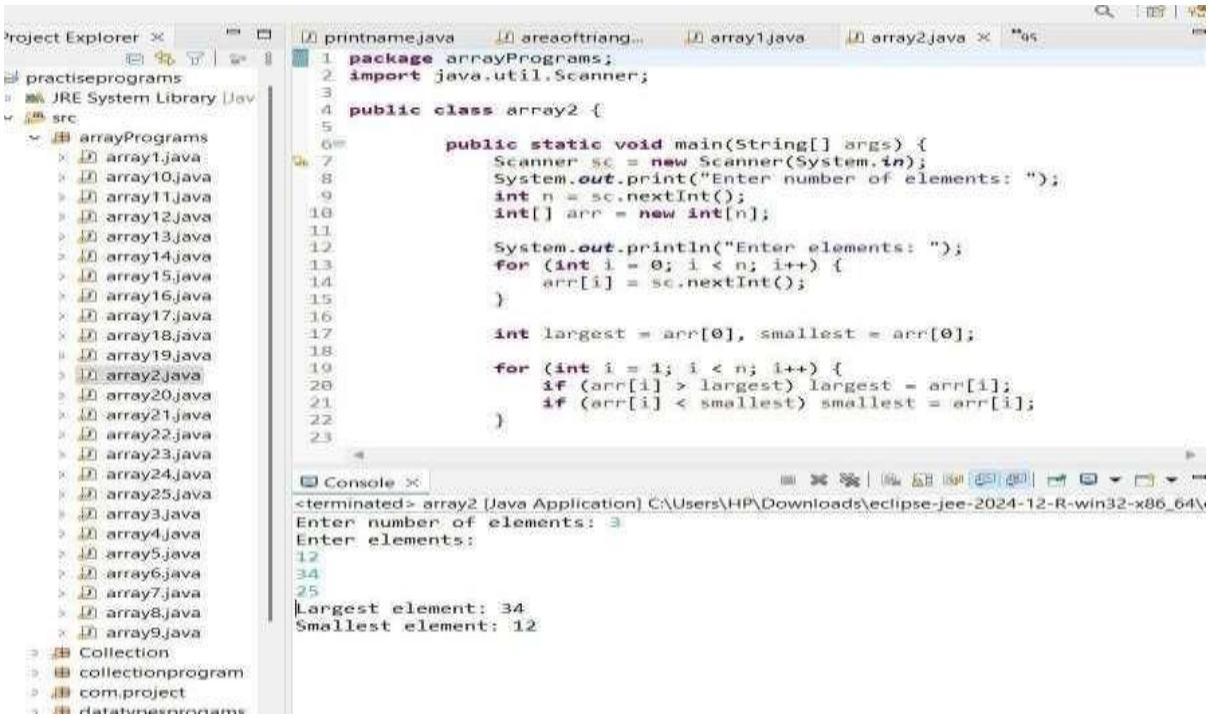


Arrays

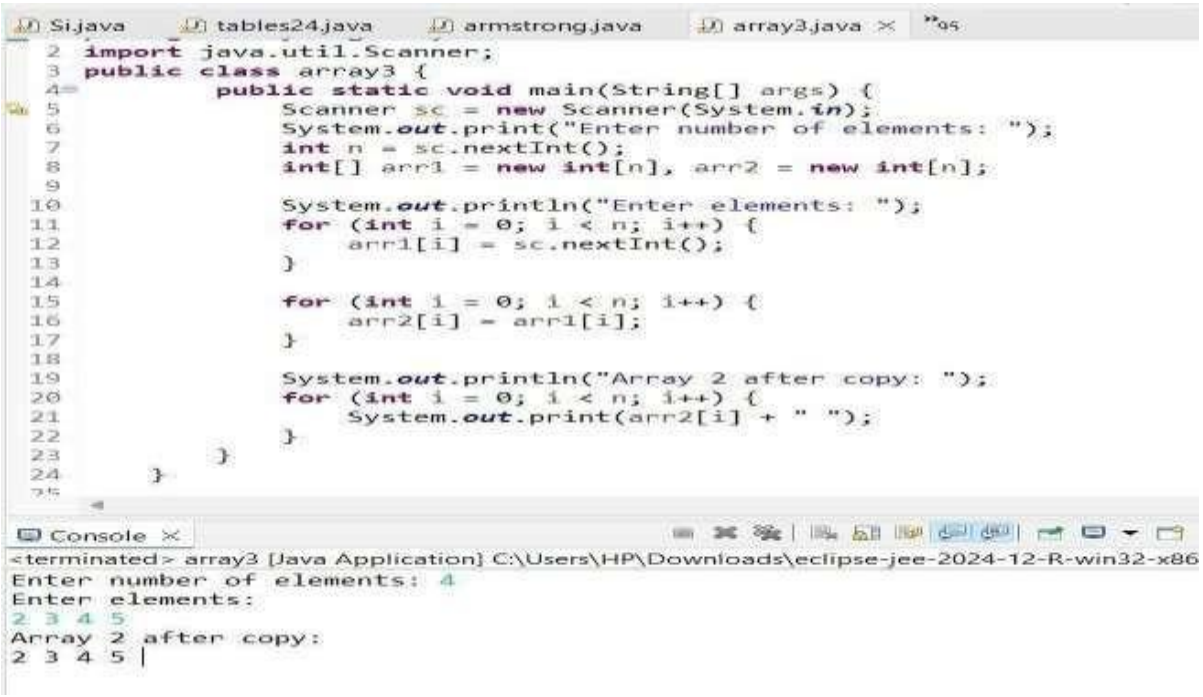
1. Write a program to find the sum of all elements in an array.



2. Write a program to find the largest and smallest elements in an array.



3. Write a program to copy elements from one array to another.



4. Write a program to remove duplicate elements from an array.

```java
package arrayPrograms;
import java.util.*;
public class array4 {
        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);
            System.out.print("Enter number of elements: ");
            int n = sc.nextInt();
            int[] arr = new int[n];

            System.out.println("Enter elements: ");
            for (int i = 0; i < n; i++) {
                arr[i] = sc.nextInt();
            }

            Set<Integer> set = new HashSet<>();
            for (int i = 0; i < n; i++) {
                set.add(arr[i]);
            }

            System.out.println("Array after removing duplicates: " + se
        }
    }

```

```
<terminated> array4 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ec
Enter number of elements: 5
Enter elements:
2
45
36
78
46
Array after removing duplicates: [2, 36, 45, 78, 46]
```

5. Write a program to reverse an array

```java
package arrayPrograms;
import java.util.Scanner;
public class array5 {

        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);
            System.out.print("Enter number of elements: ");
            int n = sc.nextInt();
            int[] arr = new int[n];

            System.out.println("Enter elements: ");
            for (int i = 0; i < n; i++) {
                arr[i] = sc.nextInt();
            }

            System.out.println("Reversed array: ");
            for (int i = n - 1; i >= 0; i--) {
                System.out.print(arr[i] + " ");
            }
        }
    }

```

```
<terminated> array5 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_
Enter number of elements: 8
Enter elements:
2
4
3
6
2
7
2
8
Reversed array:
8 2 7 2 6 3 4 2
```

6. Write a program to sort an array in ascending and descending order.

```java
package arrayPrograms;
import java.util.Arrays;
public class array6 {
        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);
            System.out.print("Enter number of elements: ");
            int n = sc.nextInt();
            int[] arr = new int[n];

            System.out.println("Enter elements: ");
            for (int i = 0; i < n; i++) {
                arr[i] = sc.nextInt();
            }

            Arrays.sort(arr);
            System.out.println("Array in ascending order: " + Arrays.to

            // Descending order
            for (int i = 0; i < n / 2; i++) {
                int temp = arr[i];
                arr[i] = arr[n - 1 - i];
                arr[n - 1 - i] = temp;
            }
            System.out.println("Array in descending order: " + Arrays.t
        }
    }
```

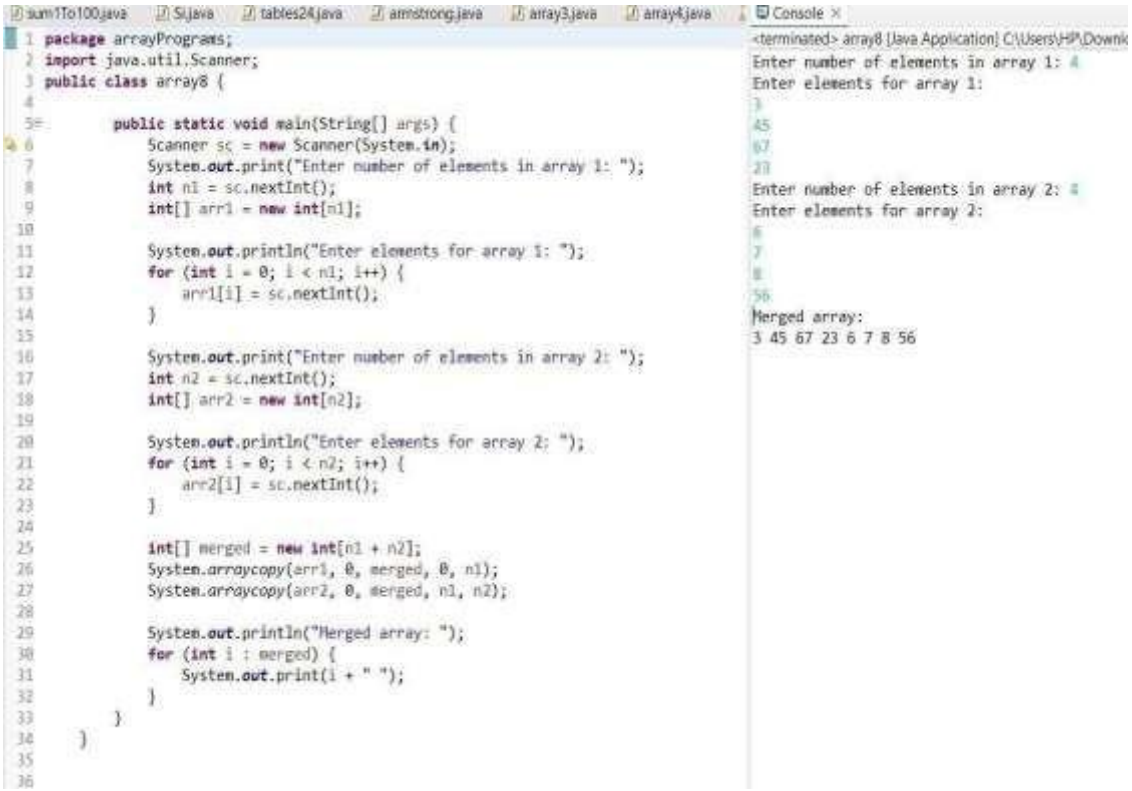
```
<terminated> array6 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecli
Enter number of elements: 5
Enter elements:
3
4
5
3
4
Array in ascending order: [3, 3, 4, 4, 5]
Array in descending order: [5, 4, 4, 3, 3]
```

7. Write a program to find the frequency of each element in an array

```java
package arrayPrograms;
import java.util.*;
public class array7 {

        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);
            System.out.print("Enter number of elements: ");
            int n = sc.nextInt();
            int[] arr = new int[n];

            System.out.println("Enter elements: ");
            for (int i = 0; i < n; i++) {
                arr[i] = sc.nextInt();
            }

            Map<Integer, Integer> frequencyMap = new HashMap<>();
            for (int i = 0; i < n; i++) {
                frequencyMap.put(arr[i], frequencyMap.getOrDefault(arr[
            }

            System.out.println("Frequency of elements: " + frequencyMap
        }
    }
```

```
<terminated> array7 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\eclip
Enter number of elements: 6
Enter elements:
4
5
6
23
3
4
Frequency of elements: {3=1, 4=2, 5=1, 6=1, 23=1}
```

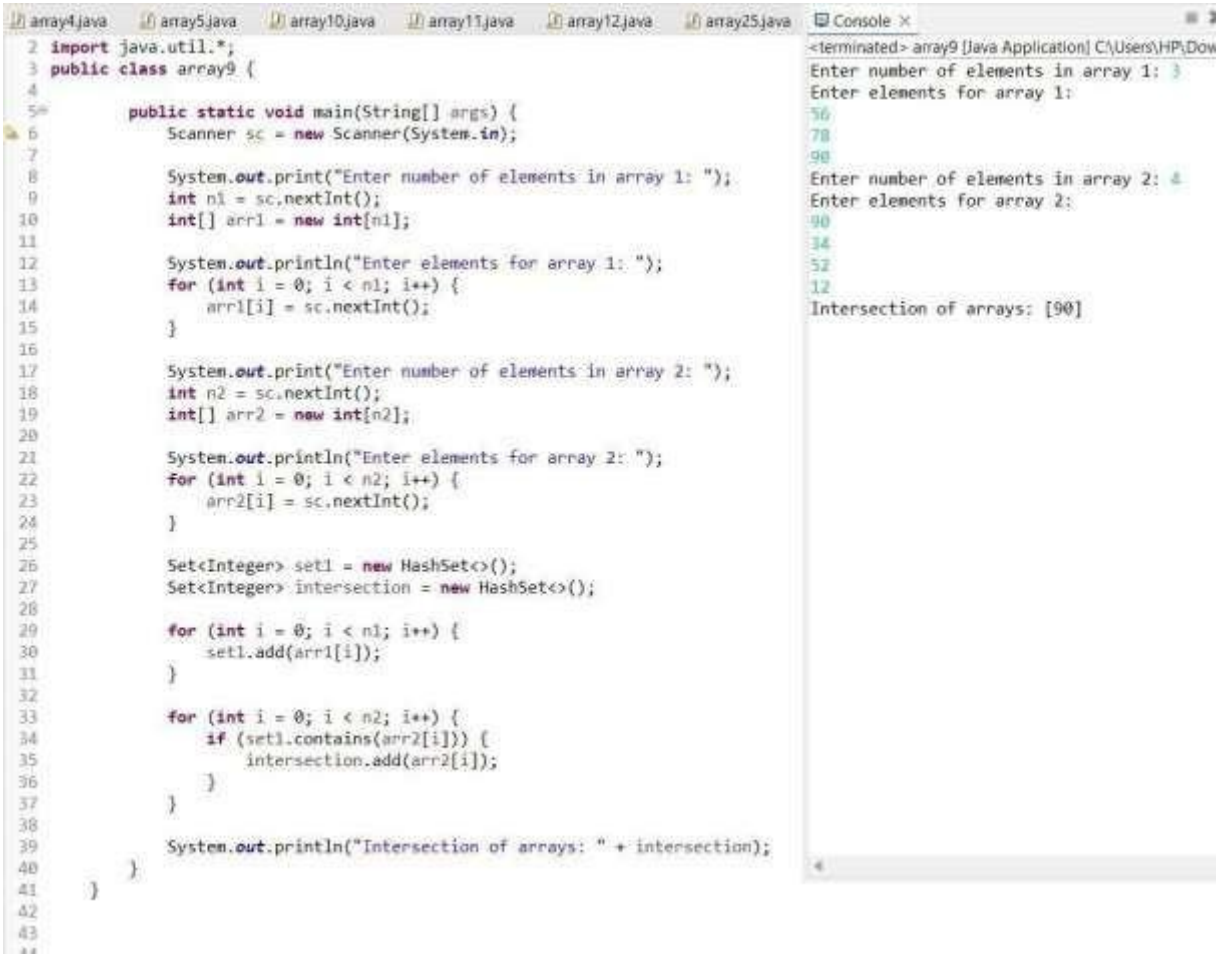
8. Write a program to merge two sorted arrays.



```java
package arrayPrograms;
import java.util.Scanner;
public class array8 {

	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);
		System.out.print("Enter number of elements in array 1: ");
		int n1 = sc.nextInt();
		int[] arr1 = new int[n1];

		System.out.println("Enter elements for array 1: ");
		for (int i = 0; i < n1; i++) {
			arr1[i] = sc.nextInt();
		}

		System.out.print("Enter number of elements in array 2: ");
		int n2 = sc.nextInt();
		int[] arr2 = new int[n2];

		System.out.println("Enter elements for array 2: ");
		for (int i = 0; i < n2; i++) {
			arr2[i] = sc.nextInt();
		}

		int[] merged = new int[n1 + n2];
		System.arraycopy(arr1, 0, merged, 0, n1);
		System.arraycopy(arr2, 0, merged, n1, n2);

		System.out.println("Merged array: ");
		for (int i : merged) {
			System.out.print(i + " ");
		}
	}
}
```

```
Enter number of elements in array 1: 4
Enter elements for array 1:
3
45
67
23
Enter number of elements in array 2: 4
Enter elements for array 2:
6
7
8
56
Merged array:
3 45 67 23 6 7 8 56
```

9. Write a program to find the intersection of two arrays.



```java
import java.util.*;
public class array9 {

	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);

		System.out.print("Enter number of elements in array 1: ");
		int n1 = sc.nextInt();
		int[] arr1 = new int[n1];

		System.out.println("Enter elements for array 1: ");
		for (int i = 0; i < n1; i++) {
			arr1[i] = sc.nextInt();
		}

		System.out.print("Enter number of elements in array 2: ");
		int n2 = sc.nextInt();
		int[] arr2 = new int[n2];

		System.out.println("Enter elements for array 2: ");
		for (int i = 0; i < n2; i++) {
			arr2[i] = sc.nextInt();
		}

		Set<Integer> set1 = new HashSet<>();
		Set<Integer> intersection = new HashSet<>();

		for (int i = 0; i < n1; i++) {
			set1.add(arr1[i]);
		}

		for (int i = 0; i < n2; i++) {
			if (set1.contains(arr2[i])) {
				intersection.add(arr2[i]);
			}
		}

		System.out.println("Intersection of arrays: " + intersection);
	}
}
```

```
Enter number of elements in array 1: 3
Enter elements for array 1:
56
78
90
Enter number of elements in array 2: 4
Enter elements for array 2:
90
34
52
12
Intersection of arrays: [90]
```

10. Write a program to check whether an array is palindrome or not.

```java
package arrayPrograms;
import java.util.Scanner;
public class array10 {
	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);
		System.out.print("Enter number of elements: ");
		int n = sc.nextInt();
		int[] arr = new int[n];

		System.out.println("Enter elements: ");
		for (int i = 0; i < n; i++) {
			arr[i] = sc.nextInt();
		}

		boolean isPalindrome = true;
		for (int i = 0; i < n / 2; i++) {
			if (arr[i] != arr[n - 1 - i]) {
				isPalindrome = false;
				break;
			}
		}

		if (isPalindrome) {
			System.out.println("Array is a palindrome.");
		} else {
			System.out.println("Array is not a palindrome.");
		}
	}
}
```

```
<terminated> array10 [Java Application] C:\Users\HP\Do
Enter number of elements: 4
Enter elements:
34
34
56
67
Array is not a palindrome.
```

11. Write a program to find the sum of all positive numbers in an array.

```java
package arrayPrograms;
import java.util.Scanner;
public class array11 {

	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);
		System.out.print("Enter number of elements: ");
		int n = sc.nextInt();
		int[] arr = new int[n];
		int sum = 0;

		System.out.println("Enter elements: ");
		for (int i = 0; i < n; i++) {
			arr[i] = sc.nextInt();
			if (arr[i] > 0) {
				sum += arr[i];
			}
		}

		System.out.println("Sum of positive numbers: " + sum);
	}
}
```

```
<terminated> array11 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\e
Enter number of elements: 7
Enter elements:
2
34
15
36
16
47
32
Sum of positive numbers: 182
```

12. Write a program to find the sum of all negative numbers in an array.

```java
public class array12 {

        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);
            System.out.print("Enter number of elements: ");
            int n = sc.nextInt();
            int[] arr = new int[n];
            int sum = 0;

            System.out.println("Enter elements: ");
            for (int i = 0; i < n; i++) {
                arr[i] = sc.nextInt();
                if (arr[i] < 0) {
                    sum += arr[i];
                }
            }

            System.out.println("Sum of negative numbers: " + sum);
        }
    }
```

```
<terminated> array12 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_
Enter number of elements: 4
Enter elements:
-34
26
50
-21
Sum of negative numbers: -55
```

13. Write a program to find the product of all elements in an array.

```java
package arrayPrograms;
import java.util.Scanner;
public class array13 {

        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);
            System.out.print("Enter number of elements: ");
            int n = sc.nextInt();
            int[] arr = new int[n];
            int product = 1;

            System.out.println("Enter elements: ");
            for (int i = 0; i < n; i++) {
                arr[i] = sc.nextInt();
                product *= arr[i];
            }

            System.out.println("Product of elements: " + product);
        }
    }
```

```
<terminated> array13 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64
Enter number of elements: 5
Enter elements:
34
24

123
33
23
Product of elements: 76179312
```

14. Write a program to find the second largest and second smallest elements in an array

```java
package arrayPrograms;
import java.util.Arrays;
public class array14 {
        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);
            System.out.print("Enter number of elements: ");
            int n = sc.nextInt();
            int[] arr = new int[n];

            System.out.println("Enter elements: ");
            for (int i = 0; i < n; i++) {
                arr[i] = sc.nextInt();
            }

            Arrays.sort(arr);

            System.out.println("Second smallest element: " + arr[1]);
            System.out.println("Second largest element: " + arr[n - 2]);
        }
    }
```

```
<terminated> array14 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\e
Enter number of elements: 5
Enter elements:
3
5
6
23
4
Second smallest element: 4
Second largest element: 6
```

15. Write a program to find the index of a given element in an array.

```java
package arrayPrograms;
import java.util.Scanner;
public class array15 {

        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);
            System.out.print("Enter number of elements: ");
            int n = sc.nextInt();
            int[] arr = new int[n];

            System.out.println("Enter elements: ");
            for (int i = 0; i < n; i++) {
                arr[i] = sc.nextInt();
            }

            System.out.print("Enter element to search: ");
            int target = sc.nextInt();

            int index = -1;
            for (int i = 0; i < n; i++) {
                if (arr[i] == target) {
                    index = i;
                    break;
```

```
<terminated> array15 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x
Enter number of elements: 3
Enter elements:
23
14
25
Enter element to search: 34
Element not found.
```

16. Write a program to rotate an array to the left or right.

```java
package arrayPrograms;
import java.util.Scanner;
public class array16 {

	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);
		System.out.print("Enter number of elements: ");
		int n = sc.nextInt();
		int[] arr = new int[n];

		System.out.println("Enter elements: ");
		for (int i = 0; i < n; i++) {
			arr[i] = sc.nextInt();
		}

		System.out.print("Enter the number of positions to rotate:
		int k = sc.nextInt();

		// Left rotation
		int[] rotatedLeft = new int[n];
		for (int i = 0; i < n; i++) {
			rotatedLeft[i] = arr[(i + k) % n];
		}
```

```
<terminated> array16 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\
Enter number of elements: 3
Enter elements:
23
45
67
Enter the number of positions to rotate: 2
Array after left rotation:
67 23 45
Array after right rotation:
45 67 23
```

17. Write a program to print the elements of a 2D array in spiral order.

```java
public class array17 {

	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);
		System.out.print("Enter number of rows: ");
		int m = sc.nextInt();
		System.out.print("Enter number of columns: ");
		int n = sc.nextInt();
		int[][] matrix = new int[m][n];

		System.out.println("Enter matrix elements: ");
		for (int i = 0; i < m; i++) {
			for (int j = 0; j < n; j++) {
				matrix[i][j] = sc.nextInt();
			}
		}

		int top = 0, bottom = m - 1, left = 0, right = n - 1;

		while (top <= bottom && left <= right) {
			for (int i = left; i <= right; i++) {
				System.out.print(matrix[top][i] + " ");
			}
			top++;

			for (int i = top; i <= bottom; i++) {
				System.out.print(matrix[i][right] + " ");
			}
			right--;

			if (top <= bottom) {
				for (int i = right; i >= left; i--) {
					System.out.print(matrix[bottom][i] + " ");
				}
				bottom--;
			}

			if (left <= right) {
				for (int i = bottom; i >= top; i--) {
					System.out.print(matrix[i][left] + " ");
				}
				left++;
			}
```

```
<terminated> array17 [Java Application] C
Enter number of rows: 3
Enter number of columns: 3
Enter matrix elements:
23
12
14
25
3
6
5
67
56
23 12 14 6 56 67 5 25 3
```

18. Write a program to check whether two arrays are equal or not

```java
package arrayPrograms;
import java.util.Scanner;
public class array18 {
	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);
		System.out.print("Enter number of elements in array 1: ");
		int n1 = sc.nextInt();
		int[] arr1 = new int[n1];

		System.out.println("Enter elements for array 1: ");
		for (int i = 0; i < n1; i++) {
			arr1[i] = sc.nextInt();
		}

		System.out.print("Enter number of elements in array 2: ");
		int n2 = sc.nextInt();
		int[] arr2 = new int[n2];

		System.out.println("Enter elements for array 2: ");
		for (int i = 0; i < n2; i++) {
			arr2[i] = sc.nextInt();
		}

		boolean isEqual = (n1 == n2);

		if (isEqual) {
			for (int i = 0; i < n1; i++) {
				if (arr1[i] != arr2[i]) {
					isEqual = false;
					break;
				}
			}
		}

		if (isEqual) {
			System.out.println("Arrays are equal.");
		} else {
			System.out.println("Arrays are not equal.");
		}
	}
}
```

```
<terminated> array18 [Java Application] C:\Users\HP\Downloads\
Enter number of elements in array 1: 3
Enter elements for array 1:
75
842
96
Enter number of elements in array 2: 4
Enter elements for array 2:
741
845
75
45
Arrays are not equal.
```

19. Write a program to find the sum of elements in the upper triangle of a

```java
package arrayPrograms;
import java.util.Scanner;

public class array19 {
	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);
		System.out.print("Enter number of rows and columns: ");
		int n = sc.nextInt();
		int[][] matrix = new int[n][n];

		System.out.println("Enter matrix elements: ");
		for (int i = 0; i < n; i++) {
			for (int j = 0; j < n; j++) {
				matrix[i][j] = sc.nextInt();
			}
		}

		int sum = 0;
		for (int i = 0; i < n; i++) {
			for (int j = i; j < n; j++) {
				sum += matrix[i][j];
			}
		}

		System.out.println("Sum of upper triangle elements: " + sum);
	}
}
```

```
<terminated> array19 [Java Application] C:\Users\HP\
Enter number of rows and columns: 2
Enter matrix elements:
34
45
34
38
Sum of upper triangle elements: 117
```

20. Write a program to find the sum of elements in the lower triangle of a matrix

```java
package arrayPrograms;
import java.util.Scanner;
public class array20 {
	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);
		System.out.print("Enter number of rows and columns: ");
		int n = sc.nextInt();
		int[][] matrix = new int[n][n];

		System.out.println("Enter matrix elements: ");
		for (int i = 0; i < n; i++) {
			for (int j = 0; j < n; j++) {
				matrix[i][j] = sc.nextInt();
			}
		}

		int sum = 0;
		for (int i = 0; i < n; i++) {
			for (int j = 0; j <= i; j++) {
				sum += matrix[i][j];
			}
		}

		System.out.println("Sum of lower triangle elements: " + sum
	}
```

```
<terminated> array20 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64
Enter number of rows and columns: 3
Enter matrix elements:
41
52
63
74
85
96
75
95
75
Sum of lower triangle elements: 445
```

21. Write a program to find the sum of elements in each row and column of a matrix.

```java
		}
	}

	System.out.println("Sum of elements in each row:");
	for (int i = 0; i < m; i++) {
		int rowSum = 0;
		for (int j = 0; j < n; j++) {
			rowSum += matrix[i][j];
		}
		System.out.println("Row " + (i + 1) + ": " + rowSum);
	}

	System.out.println("Sum of elements in each column:");
	for (int j = 0; j < n; j++) {
		int colSum = 0;
		for (int i = 0; i < m; i++) {
			colSum += matrix[i][j];
		}
		System.out.println("Column " + (j + 1) + ": " + colSum);
```

```
<terminated> array21 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64
Enter number of rows: 3
Enter number of columns: 2
Enter matrix elements:
74
85
65
5
5

585
Sum of elements in each row:
Row 1: 159
Row 2: 70
Row 3: 590
Sum of elements in each column:
Column 1: 144
Column 2: 675
```

22. Write a program to check whether a given matrix is symmetric or not.

```java
package arrayPrograms;
import java.util.Scanner;
public class array22 {


        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);
            System.out.print("Enter number of rows and columns: ");
            int n = sc.nextInt();
            int[][] matrix = new int[n][n];

            System.out.println("Enter matrix elements: ");
            for (int i = 0; i < n; i++) {
                for (int j = 0; j < n; j++) {
                    matrix[i][j] = sc.nextInt();
                }
            }

            boolean isSymmetric = true;
            for (int i = 0; i < n; i++) {
                for (int j = 0; j < n; j++) {
                    if (matrix[i][j] != matrix[j][i]) {
                        isSymmetric = false;
                        break;
                    }
                }
                if (!isSymmetric) break;
            }

            if (isSymmetric) {
                System.out.println("Matrix is symmetric.");
            } else {
                System.out.println("Matrix is not symmetric.");
            }
        }
    }
```

```
<terminated> array22 [Java Application] C:\Users\HP
Enter number of rows and columns: 3
Enter matrix elements:
12
13
45
36
52
46
75
85
45
Matrix is not symmetric.
```

23. Write a program to find the saddle point of a matrix.

```java
public class array23 {
        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);
            System.out.print("Enter number of rows: ");
            int m = sc.nextInt();
            System.out.print("Enter number of columns: ");
            int n = sc.nextInt();
            int[][] matrix = new int[m][n];

            System.out.println("Enter matrix elements: ");
            for (int i = 0; i < m; i++) {
                for (int j = 0; j < n; j++) {
                    matrix[i][j] = sc.nextInt();
                }
            }

            boolean found = false;
            for (int i = 0; i < m; i++) {
                int minRow = matrix[i][0];
                int colIndex = 0;

                // Find minimum element in the row
                for (int j = 1; j < n; j++) {
                    if (matrix[i][j] < minRow) {
                        minRow = matrix[i][j];
                        colIndex = j;
                    }
                }

                // Check if the minimum element is the maximum in its column
                boolean isSaddlePoint = true;
                for (int k = 0; k < m; k++) {
                    if (matrix[k][colIndex] > minRow) {
                        isSaddlePoint = false;
                        break;
                    }
                }

                if (isSaddlePoint) {
                    System.out.println("Saddle point: " + minRow + " at position (" + (i + 1) + ", " + (colIndex + 1) + ")");
                    found = true;
                    break;
```

```
<terminated> array23 [Java Application] C:\Users\HP\Downloads\eclipse-j
Enter number of rows: 3
Enter number of columns: 3
Enter matrix elements:
23
85
74
96
42
45
Saddle point: 74 at position (2, 1)
```

24. Write a program to find the kth smallest and kth largest elements in an array

```java
package arrayPrograms;
import java.util.Arrays;
public class array24 {

	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);
		System.out.print("Enter number of elements: ");
		int n = sc.nextInt();
		int[] arr = new int[n];

		System.out.println("Enter elements: ");
		for (int i = 0; i < n; i++) {
			arr[i] = sc.nextInt();
		}

		System.out.print("Enter value of k: ");
		int k = sc.nextInt();

		Arrays.sort(arr);

		if (k <= n) {
			System.out.println(k + "th smallest element: " + arr[k - 1]);
			System.out.println(k + "th largest element: " + arr[n - k]);
		} else {
			System.out.println("k is greater than the size of the array.");
		}
	}
}
```

```
Enter number of elements: 4
Enter elements:
74
85
79
76
Enter value of k: 100
k is greater than the size of the array.
```

25. Write a program to count the number of negative, positive, and zero elements in an array.

```java
package arrayPrograms;
import java.util.Scanner;

public class array25 {

	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);
		System.out.print("Enter number of elements: ");
		int n = sc.nextInt();
		int[] arr = new int[n];

		System.out.println("Enter elements: ");
		for (int i = 0; i < n; i++) {
			arr[i] = sc.nextInt();
		}

		int positive = 0, negative = 0, zero = 0;

		for (int i = 0; i < n; i++) {
			if (arr[i] > 0) {
				positive++;
			} else if (arr[i] < 0) {
				negative++;
			} else {
				zero++;
			}
		}

		System.out.println("Positive numbers: " + positive);
		System.out.println("Negative numbers: " + negative);
		System.out.println("Zeroes: " + zero);
	}
}
```

```
Enter number of elements: 4
Enter elements:
10
4
45
86
Positive numbers: 4
Negative numbers: 0
Zeroes: 0
```

Data Types

1. Write a program to demonstrate the use of primitive data types in Java

```java
package datatypesprogams;
import java.util.Scanner;

public class datatype1 {

        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            int intValue = 10;
            double doubleValue = 20.5;
            boolean boolValue = true;
            char charValue = 'A';

            System.out.println("int: " + intValue + ", double: " + doub
        }
    }

```

```
<terminated> datatype1 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64
int: 10, double: 20.5, boolean: true, char: A
```

2. Write a program to perform arithmetic operations using float and double data types

```java
package datatypesprogams;
import java.util.Scanner;
public class datatype2 {

        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter a float value: ");
            float f = sc.nextFloat();
            System.out.print("Enter a double value: ");
            double d = sc.nextDouble();

            System.out.println("Sum: " + (f + d));
            System.out.println("Difference: " + (f - d));
            System.out.println("Product: " + (f * d));
            System.out.println("Division: " + (f / d));
        }
    }

```

```
<terminated> datatype2 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win3
Enter a float value: 3.4
Enter a double value: 344566
Sum: 344569.40000009537
Difference: -344562.59999990463
Product: 1171524.4328603745
Division: 9.867485751256454E-6
```

3. Write a program to convert an integer to binary and vice versa

```java
package datatypesprogams;
import java.util.Scanner;
public class datatype3 {
	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);

		System.out.print("Enter an integer: ");
		int num = sc.nextInt();

		String binary = Integer.toBinaryString(num);
		System.out.println("Binary: " + binary);

		System.out.print("Enter binary string: ");
		String binaryStr = sc.next();
		int backToInteger = Integer.parseInt(binaryStr, 2);
		System.out.println("Integer: " + backToInteger);
	}
}
```

```
<terminated> datatype3 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86
Enter an integer: 234
Binary: 11101010
Enter binary string: 100111011
Integer: 315
```

4. Write a program to perform operations on characters such as converting lowercase to uppercase and vice versa

```java
package datatypesprogams;
import java.util.Scanner;
public class datatype4 {
	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);

		System.out.print("Enter a character: ");
		char ch = sc.next().charAt(0);

		if (Character.isLowerCase(ch)) {
			System.out.println("Uppercase: " + Character.toUpperCas
		} else {
			System.out.println("Lowercase: " + Character.toLowerCas
		}
	}
}
```

```
<terminated> datatype4 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_
Enter a character: l
Uppercase: L
```

5. Write a program to demonstrate the use of boolean data type

```java
package datatypesprogams;
import java.util.Scanner;
public class datatype5 {
        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter a boolean value (tru
            boolean b = sc.nextBoolean();

            System.out.println("You entered: " + b);
        }
    }
```

```
<terminated> datatype5 [Java Application] C:\Users\HP\Downloads\eclipse-jee-20
Enter a boolean value (true/false): true
You entered: true
```

6. Write a program to demonstrate the use of arrays in Java

```java
package datatypesprogams;
import java.util.Scanner;
public class datatype6 {
        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter the size of the array: ");
            int size = sc.nextInt();
            int[] arr = new int[size];

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

            System.out.println("Array elements are:");
            for (int i : arr) {
                System.out.println(i);
            }
        }
```

```
<terminated> datatype6 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win
Enter the size of the array: 4
Enter 4 elements:
23
45
67
88
Array elements are:
23
45
67
88
```

7. Write a program to find the maximum and minimum values in an array of integers.

```java
package datatypesprogams;
import java.util.Scanner;
public class datatype7 {
        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter the size of the array: ");
            int size = sc.nextInt();
            int[] arr = new int[size];

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

            int max = arr[0], min = arr[0];
            for (int i = 1; i < arr.length; i++) {
                if (arr[i] > max) max = arr[i];
                if (arr[i] < min) min = arr[i];
            }

            System.out.println("Max: " + max + ", Min: " + min);
        }
    }
```

```
<terminated> datatype7 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x8
Enter the size of the array: 3
Enter 3 elements:
23
44
55
Max: 55, Min: 23
```

8. Write a program to calculate the average of elements in an array

```java
package datatypesprogams;
import java.util.Scanner;
public class datatype8 {
        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter the size of the array: ");
            int size = sc.nextInt();
            int[] arr = new int[size];

            System.out.println("Enter " + size + " elements:");
            int sum = 0;
            for (int i = 0; i < size; i++) {
                arr[i] = sc.nextInt();
                sum += arr[i];
            }

            double average = (double) sum / size;
            System.out.println("Average: " + average);
        }
    }
```

```
<terminated> datatype8 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32
Enter the size of the array: 4
Enter 4 elements:
2
34
55
32
Average: 30.75
```

9. Write a program to find the length of a string

datatype6.java | datatype7.java | datatype8.java | datatype9.java

```java
package datatypesprogams;
import java.util.Scanner;
public class datatype9 {

	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);

		System.out.print("Enter a string: ");
		String str = sc.next();

		System.out.println("Length of the string: " + str.length())
	}
}
```

Console

<terminated> datatype9 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\

```
Enter a string: ammu is beautiful
Length of the string: 4
```

10. Write a program to concatenate two strings.

datatype10.java | datatype7.java | datatype8.java | datatype9.java

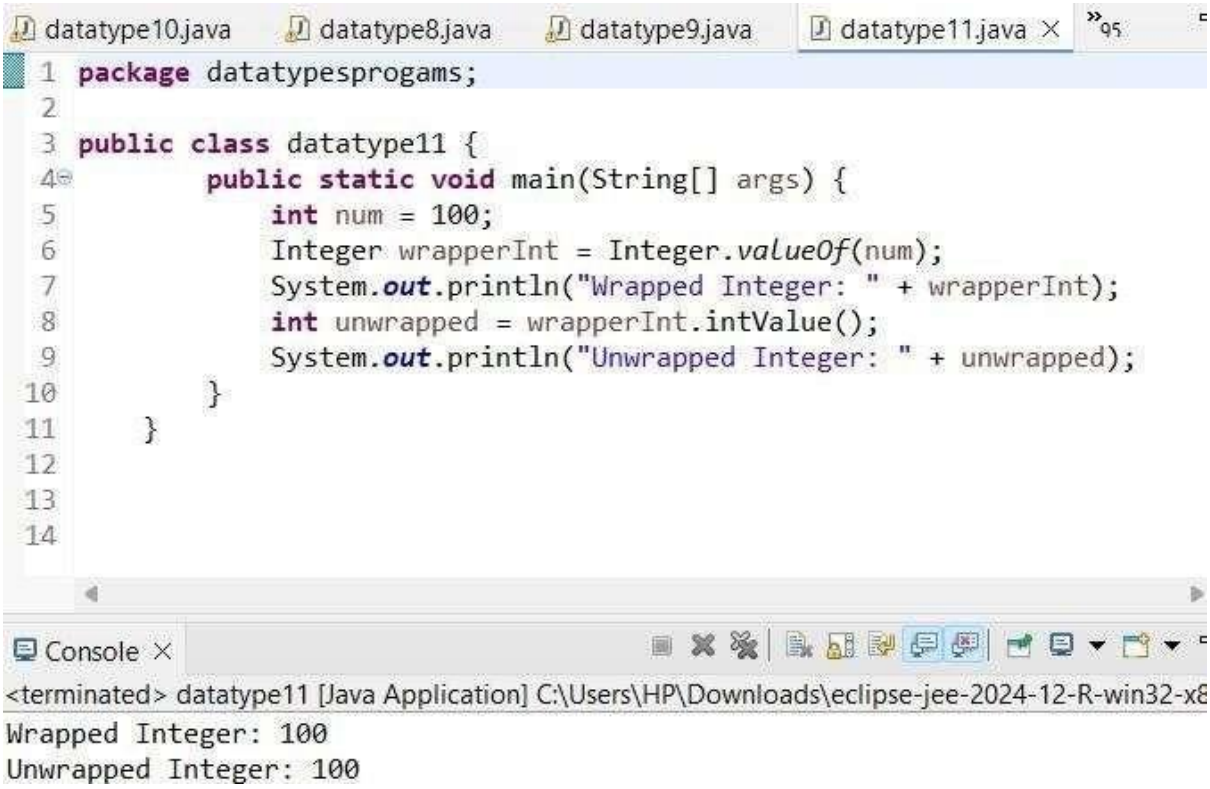
```java
package datatypesprogams;
import java.util.Scanner;
public class datatype10 {
	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);

		System.out.print("Enter first string: ");
		String str1 = sc.next();
		System.out.print("Enter second string: ");
		String str2 = sc.next();

		String result = str1 + str2;
		System.out.println("Concatenated string: " + result);
	}
}
```

Console

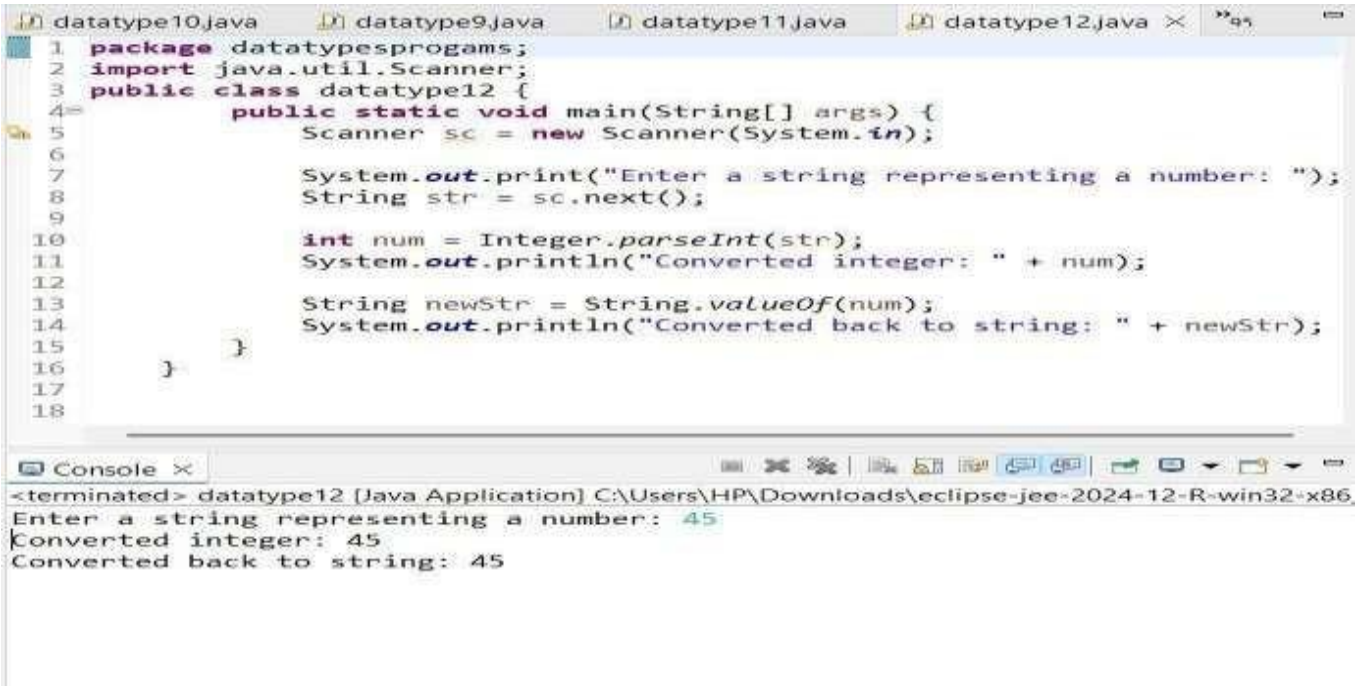
<terminated> datatype10 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_6

```
Enter first string: amma
Enter second string: nanna
Concatenated string: ammananna
```

11. Write a program to demonstrate the use of wrapper classes in Java.



12. Write a program to convert a string to integer and vice versa.



13. Write a program to demonstrate the use of string methods such as substring, index Of and equals.

```java
package datatypesprogams;
import java.util.Scanner;
public class datatype13 {
        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter a string: ");
            String str = sc.next();

            System.out.print("Enter a substring to search for: ");
            String subStr = sc.next();

            System.out.println("Substring (first 3 characters): " + str
            System.out.println("Index of substring: " + str.indexOf(sub
            System.out.println("Are the strings equal? " + str.equals(s
        }
    }
```

```
<terminated> datatype13 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_
Enter a string: representation
Enter a substring to search for: present
Substring (first 3 characters): rep
Index of substring: 2
Are the strings equal? false
```

14. Write a program to count the occurrences of a character in a string.

```java
package datatypesprogams;
import java.util.Scanner;
public class datatype14 {
        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter a string: ");
            String str = sc.next();

            System.out.print("Enter the character to count: ");
            char ch = sc.next().charAt(0);

            int count = 0;
            for (int i = 0; i < str.length(); i++) {
                if (str.charAt(i) == ch) {
                    count++;
                }
            }
```

```
<terminated> datatype14 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win3
Enter a string: rama
Enter the character to count: a
Character 'a' appears 2 times.
```

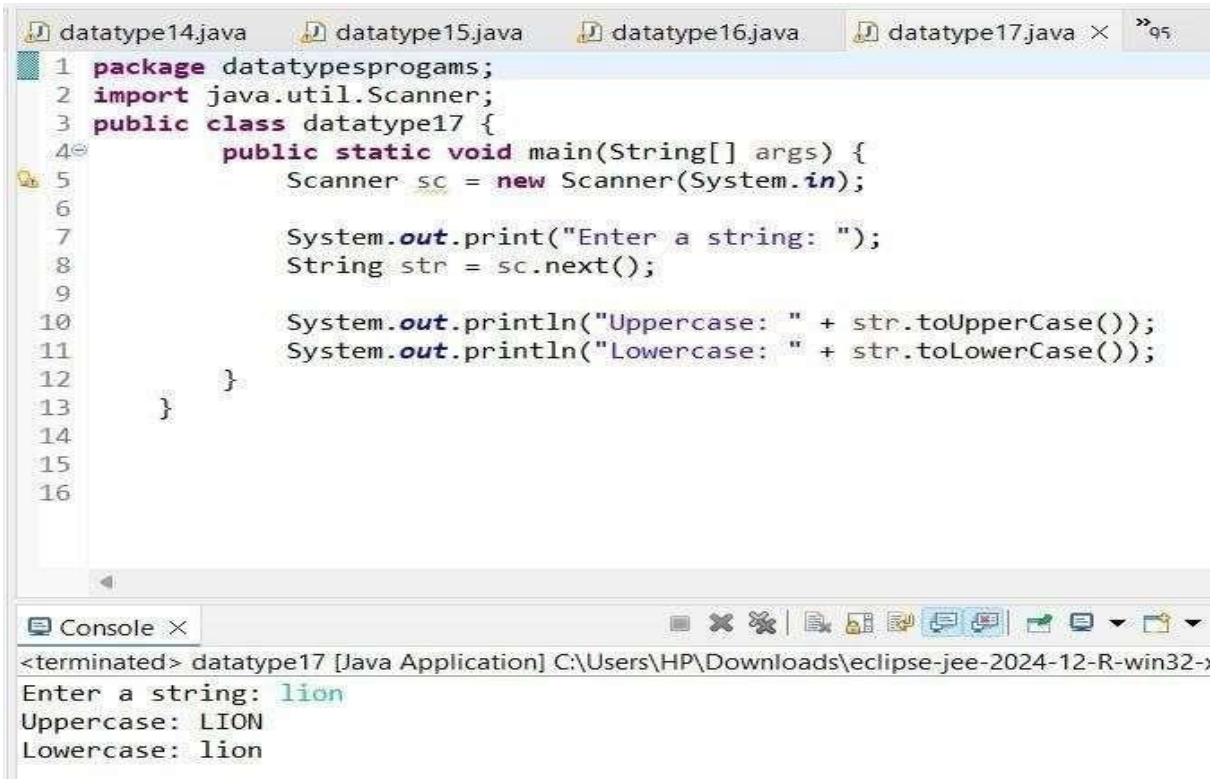
15. Write a program to check whether a given string is palindrome.

```
datatype12.java  datatype13.java  datatype14.java  datatype15.java
1  package datatypesprogams;
2  import java.util.Scanner;
3  public class datatype15 {
4          public static void main(String[] args) {
5              Scanner sc = new Scanner(System.in);
6
7              System.out.print("Enter a string: ");
8              String str = sc.next();
9
10             String reversed = new StringBuilder(str).reverse().toStrin
11             if (str.equals(reversed)) {
12                 System.out.println("Palindrome");
13             } else {
14                 System.out.println("Not a Palindrome");
15             }
16         }
17     }
18
Console
<terminated> datatype15 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x8
Enter a string: brother
Not a Palindrome
```

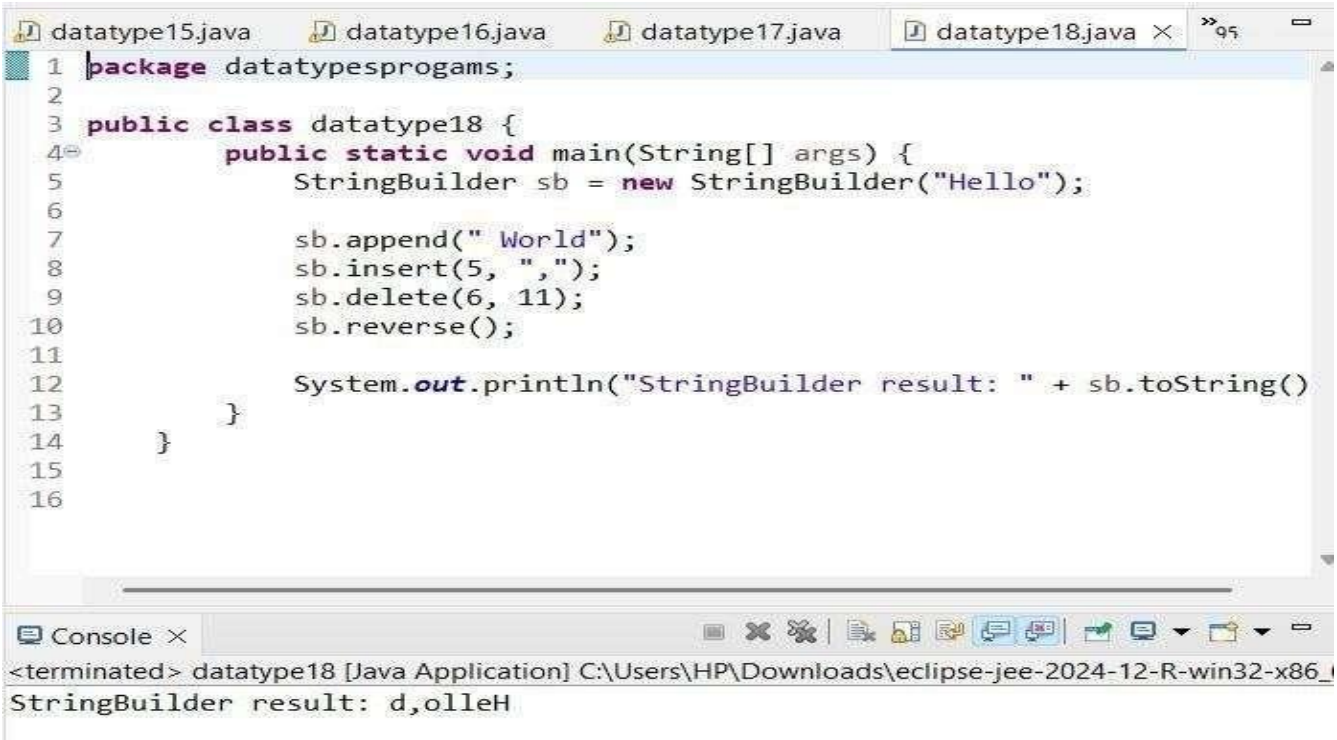
16. Write a program to reverse a string without using any built-in methods.

```
datatype13.java  datatype14.java  datatype15.java  datatype16.java
1  package datatypesprogams;
2  import java.util.Scanner;
3  public class datatype16 {
4
5          public static void main(String[] args) {
6              Scanner sc = new Scanner(System.in);
7
8              System.out.print("Enter a string: ");
9              String str = sc.next();
10
11             String reversed = "";
12             for (int i = str.length() - 1; i >= 0; i--) {
13                 reversed += str.charAt(i);
14             }
15
16             System.out.println("Reversed string: " + reversed);
17         }
18     }
Console
<terminated> datatype16 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-wir
Enter a string: tiger
Reversed string: regit
```

17. Write a program to convert a string to uppercase and vice versa.



18. Write a program to demonstrate the use of StringBuilder class.



19. Write a program to find the factorial of a number using Big Integer class.

```java
package datatypesprogams;
import java.math.BigInteger;
public class datatype19 {
        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter a number: ");
            int num = sc.nextInt();

            BigInteger factorial = BigInteger.ONE;
            for (int i = 1; i <= num; i++) {
                factorial = factorial.multiply(BigInteger.valueOf(i));
            }

            System.out.println("Factorial of " + num + ": " + factorial
        }
    }
```

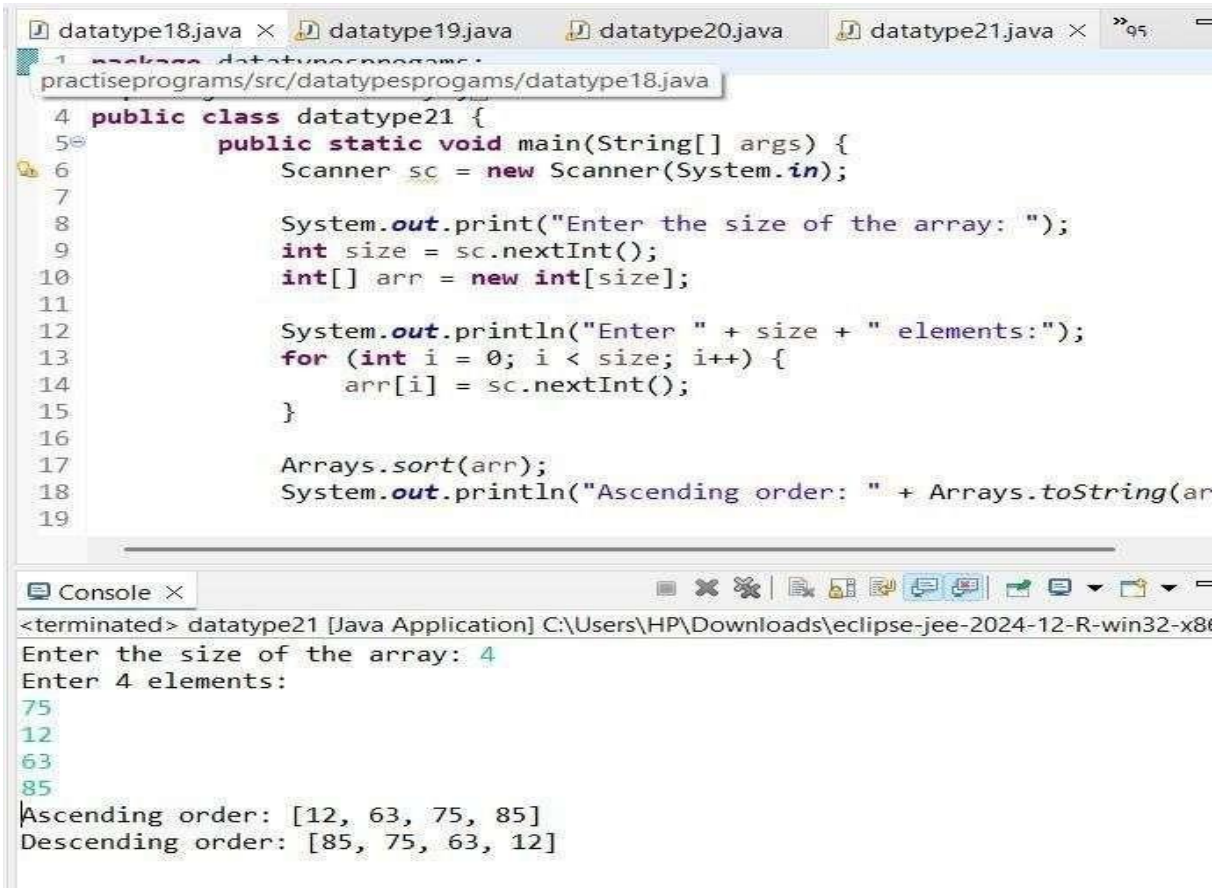
```
<terminated> datatype19 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86
Enter a number: 16
Factorial of 16: 20922789888000
```

20. Write a program to demonstrate the use of arrays of objects.

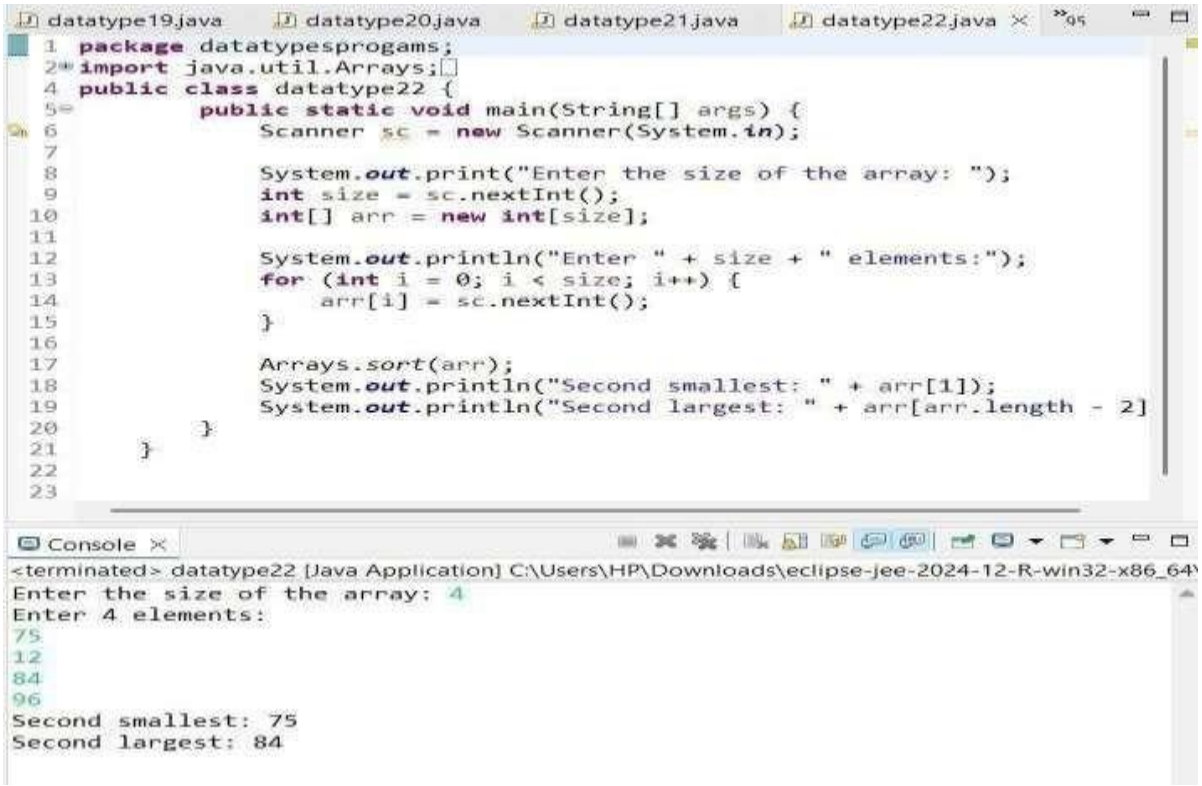
```java
package datatypesprogams;
import java.util.Scanner;
public class datatype20 {
        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter the number of objects: ");
            int n = sc.nextInt();
            String[] objects = new String[n];

            System.out.println("Enter the names of " + n + " objects:")
            for (int i = 0; i < n; i++) {
                objects[i] = sc.next();
            }

            System.out.println("Objects array: ");
            for (String object : objects) {
                System.out.println(object);
```

```
<terminated> datatype20 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_
Enter the number of objects: 3
Enter the names of 3 objects:
ret
gfd
abc
Objects array:
ret
gfd
abc
```

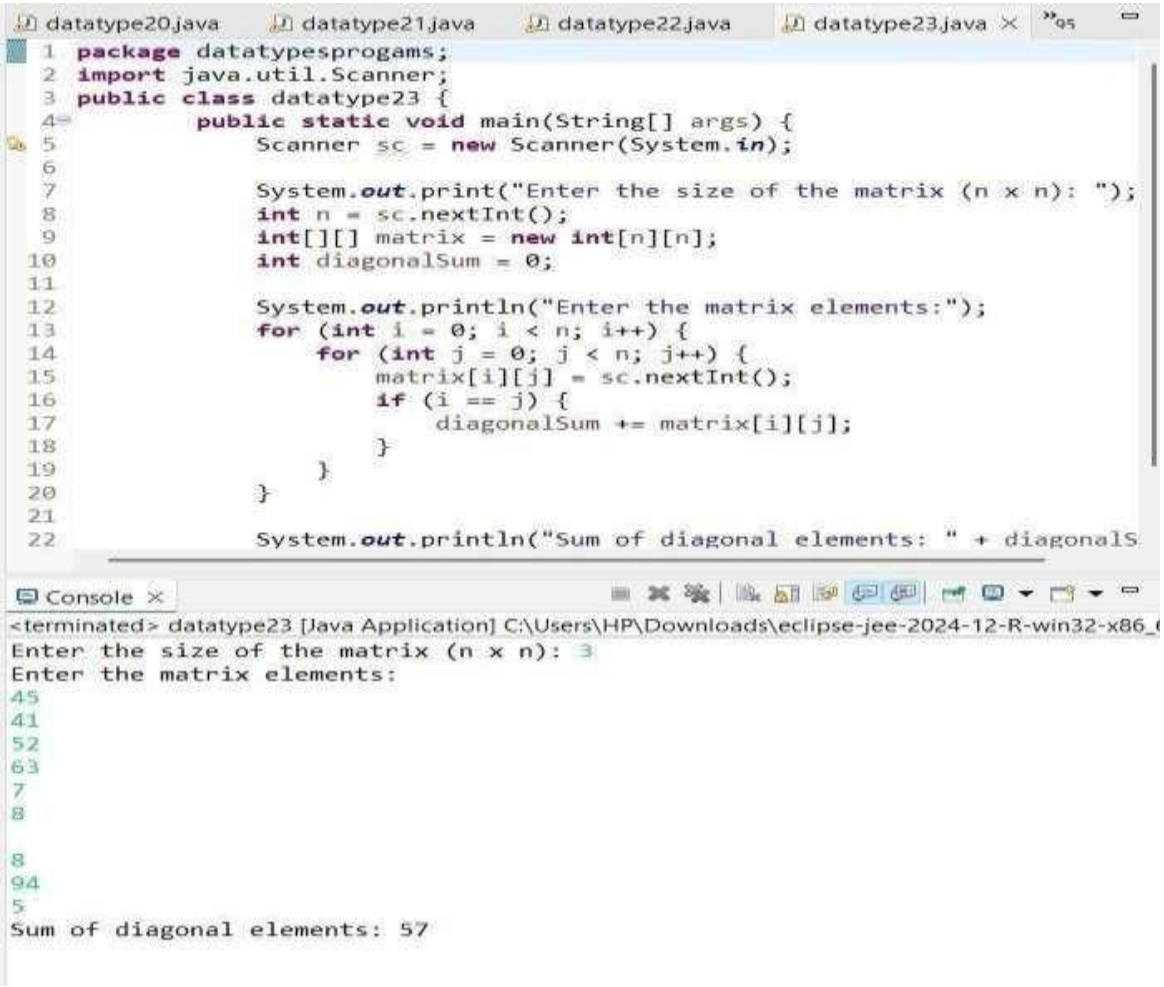
21. Write a program to sort an array of integers in ascending and descending order.



22. Write a program to find the second largest and second smallest elements in an array

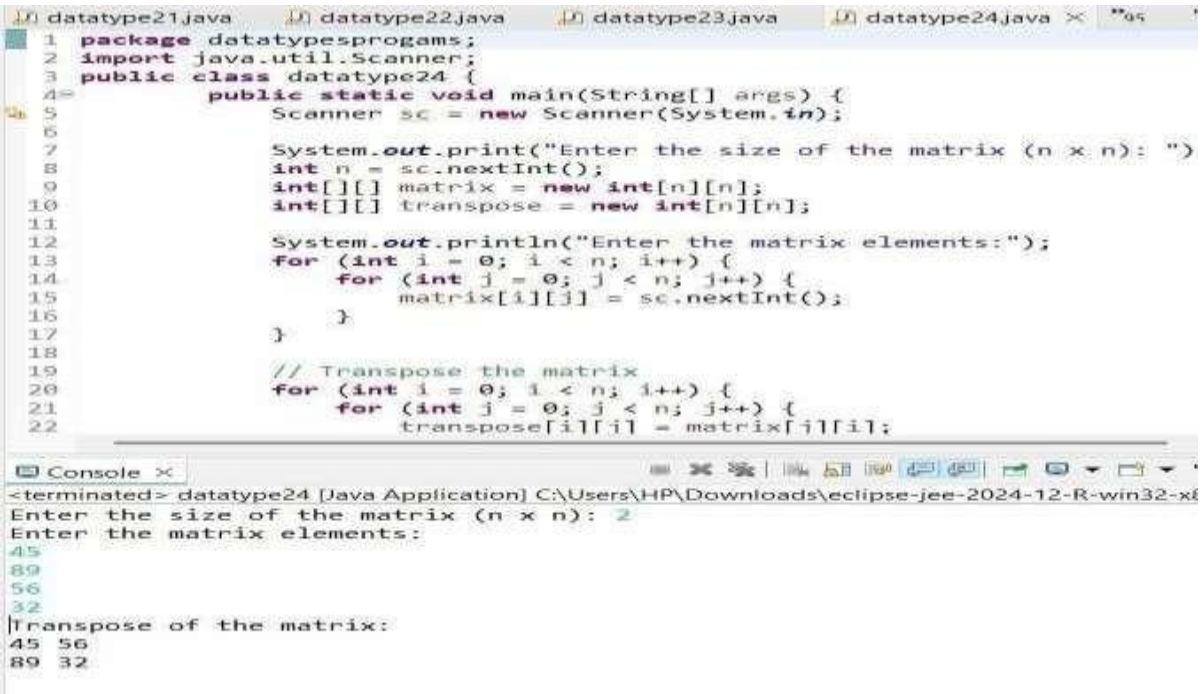


23. Write a program to find the sum of diagonal elements of a matrix



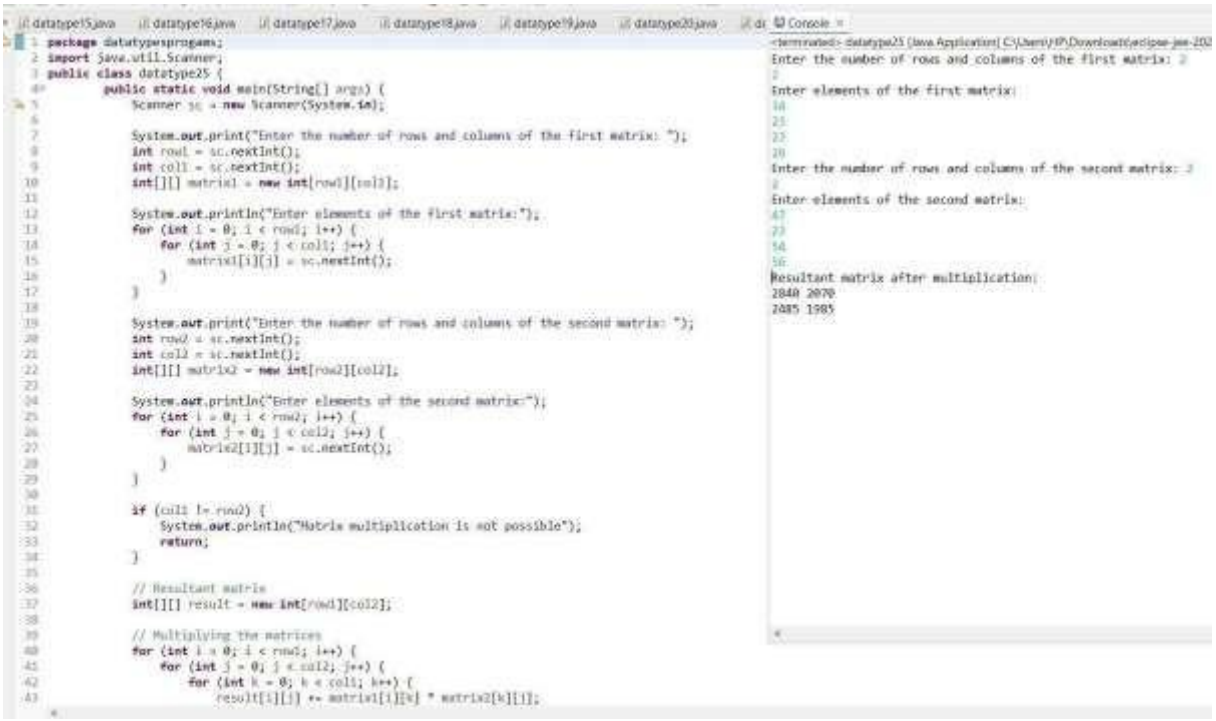
```
datatype20.java  datatype21.java  datatype22.java  datatype23.java
 1 package datatypesprogams;
 2 import java.util.Scanner;
 3 public class datatype23 {
 4         public static void main(String[] args) {
 5             Scanner sc = new Scanner(System.in);
 6
 7             System.out.print("Enter the size of the matrix (n x n): ");
 8             int n = sc.nextInt();
 9             int[][] matrix = new int[n][n];
10             int diagonalSum = 0;
11
12             System.out.println("Enter the matrix elements:");
13             for (int i = 0; i < n; i++) {
14                 for (int j = 0; j < n; j++) {
15                     matrix[i][j] = sc.nextInt();
16                     if (i == j) {
17                         diagonalSum += matrix[i][j];
18                     }
19                 }
20             }
21
22             System.out.println("Sum of diagonal elements: " + diagonalS

Console
<terminated> datatype23 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_
Enter the size of the matrix (n x n): 3
Enter the matrix elements:
45
41
52
63
7
8

8
94
5
Sum of diagonal elements: 57
```

24. Write a program to transpose a matrix.



```
datatype21.java  datatype22.java  datatype23.java  datatype24.java
 1 package datatypesprogams;
 2 import java.util.Scanner;
 3 public class datatype24 {
 4         public static void main(String[] args) {
 5             Scanner sc = new Scanner(System.in);
 6
 7             System.out.print("Enter the size of the matrix (n x n): ")
 8             int n = sc.nextInt();
 9             int[][] matrix = new int[n][n];
10             int[][] transpose = new int[n][n];
11
12             System.out.println("Enter the matrix elements:");
13             for (int i = 0; i < n; i++) {
14                 for (int j = 0; j < n; j++) {
15                     matrix[i][j] = sc.nextInt();
16                 }
17             }
18
19             // Transpose the matrix
20             for (int i = 0; i < n; i++) {
21                 for (int j = 0; j < n; j++) {
22                     transpose[i][j] = matrix[j][i];

Console
<terminated> datatype24 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x8
Enter the size of the matrix (n x n): 2
Enter the matrix elements:
45
89
56
32
Transpose of the matrix:
45 56
89 32
```

25. Write a program to multiply two matrices.

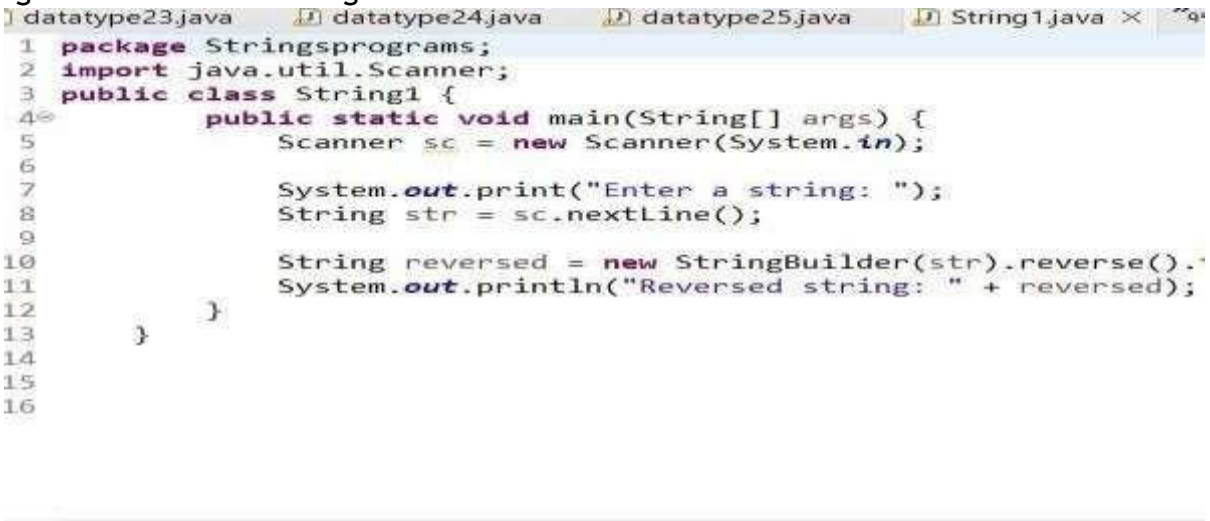


```
package datatypesprograms;
import java.util.Scanner;
public class datatype25 {
	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);

		System.out.print("Enter the number of rows and columns of the first matrix: ");
		int row1 = sc.nextInt();
		int col1 = sc.nextInt();
		int[][] matrix1 = new int[row1][col1];

		System.out.println("Enter elements of the first matrix:");
		for (int i = 0; i < row1; i++) {
			for (int j = 0; j < col1; j++) {
				matrix1[i][j] = sc.nextInt();
			}
		}

		System.out.print("Enter the number of rows and columns of the second matrix: ");
		int row2 = sc.nextInt();
		int col2 = sc.nextInt();
		int[][] matrix2 = new int[row2][col2];

		System.out.println("Enter elements of the second matrix:");
		for (int i = 0; i < row2; i++) {
			for (int j = 0; j < col2; j++) {
				matrix2[i][j] = sc.nextInt();
			}
		}

		if (col1 != row2) {
			System.out.println("Matrix multiplication is not possible");
			return;
		}

		// Resultant matrix
		int[][] result = new int[row1][col2];

		// Multiplying the matrices
		for (int i = 0; i < row1; i++) {
			for (int j = 0; j < col2; j++) {
				for (int k = 0; k < col1; k++) {
					result[i][j] += matrix1[i][k] * matrix2[k][j];
```

```
Enter the number of rows and columns of the first matrix: 2
2
Enter elements of the first matrix:
10
25
23
20
Enter the number of rows and columns of the second matrix: 2
2
Enter elements of the second matrix:
47
23
54
56
Resultant matrix after multiplication:
2040 2070
2085 1985
```

STRINGS

1. Write a program to reverse a string



```
datatype23.java   datatype24.java   datatype25.java   String1.java
1  package Stringsprograms;
2  import java.util.Scanner;
3  public class String1 {
4          public static void main(String[] args) {
5              Scanner sc = new Scanner(System.in);
6
7              System.out.print("Enter a string: ");
8              String str = sc.nextLine();
9
10             String reversed = new StringBuilder(str).reverse().
11             System.out.println("Reversed string: " + reversed);
12         }
13     }
14
15
16
```

```
Console
erminated> String1 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win
nter a string: rose flower
eversed string: rewolf esor
```

2. Write a program to check whether a given string is palindrome or not

```java
package Stringsprograms;
import java.util.Scanner;
public class String2 {
        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter a string: ");
            String str = sc.nextLine();

            String reversed = new StringBuilder(str).reverse().toString

            if (str.equals(reversed)) {
                System.out.println("The string is a palindrome.");
            } else {
                System.out.println("The string is not a palindrome.");
            }
        }
    }
```

```
<terminated> String2 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64
Enter a string: random
The string is not a palindrome.
```

3. Write a program to count the number of vowels and consonants in a string.

```java
package Stringsprograms;
import java.util.Scanner;
public class String3 {
        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter a string: ");
            String str = sc.nextLine().toLowerCase();

            int vowels = 0, consonants = 0;

            for (int i = 0; i < str.length(); i++) {
                char ch = str.charAt(i);
                if (ch >= 'a' && ch <= 'z') {
                    if (ch == 'a' || ch == 'e' || ch == 'i' || ch == 'o
                        vowels++;
                    } else {
                        consonants++;
                    }
                }
```

```
<terminated> String3 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\
Enter a string: peacock
Vowels: 3
Consonants: 4
```

18. Write a program to count the occurrences of a character in a string.

String1.java String2.java String3.java string4.java

```
1  package Stringsprograms;
2  import java.util.Scanner;
3  public class string4 {
4          public static void main(String[] args) {
5              Scanner sc = new Scanner(System.in);
6
7              System.out.print("Enter a string: ");
8              String str = sc.nextLine();
9
10             System.out.print("Enter the character to count: ");
11             char ch = sc.next().charAt(0);
12
13             int count = 0;
14             for (int i = 0; i < str.length(); i++) {
15                 if (str.charAt(i) == ch) {
16                     count++;
17                 }
18             }
19
20             System.out.println("Character '" + ch + "' appears " + coun
21         }
22     }
23
```

Console

```
<terminated> string4 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ec
Enter a string: dog is an animal
Enter the character to count: a
Character 'a' appears 4 times.
```

18. Write a program to remove all white spaces from a string.

String2.java String3.java string4.java string5.java

```
1  package Stringsprograms;
2  import java.util.Scanner;
3  public class string5 {
4          public static void main(String[] args) {
5              Scanner sc = new Scanner(System.in);
6
7              System.out.print("Enter a string: ");
8              String str = sc.nextLine();
9
10             String result = str.replaceAll("\\s+", "");
11             System.out.println("String without spaces: " + result);
12         }
13     }
14
```

Console

```
<terminated> string5 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecli
Enter a string: varchar is a datatype
String without spaces: varcharisadatatype
```

6. Write a program to find the length of a string.

String3.java string4.java string5.java string6.java

```
1  package Stringsprograms;
2  import java.util.Scanner;
3  public class string6 {
4          public static void main(String[] args) {
5              Scanner sc = new Scanner(System.in);
6
7              System.out.print("Enter a string: ");
8              String str = sc.nextLine();
9
10             System.out.println("Length of the string: " + str.length())
11         }
12     }
13
14
```

Console

<terminated> string6 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ec

```
Enter a string: java application
Length of the string: 16
```

8. Write a program to convert lowercase letters to uppercase and vice versa.

String3.java string4.java string5.java string6.java string7.java

```
1  package Stringsprograms;
2  import java.util.Scanner;
3  public class string7 {
4          public static void main(String[] args) {
5              Scanner sc = new Scanner(System.in);
6
7              System.out.print("Enter a string: ");
8              String str = sc.nextLine();
9
10             System.out.println("Uppercase: " + str.toUpperCase());
11             System.out.println("Lowercase: " + str.toLowerCase());
12         }
13     }
14
```

Console

<terminated> string7 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecli

```
Enter a string: program is aset of instructions
Uppercase: PROGRAM IS ASET OF INSTRUCTIONS
Lowercase: program is aset of instructions
```

7. Write a program to concatenate two strings.

string4.java string5.java string6.java string7.java string8.java

```
1  package Stringsprograms;
2  import java.util.Scanner;
3  public class string8 {
4          public static void main(String[] args) {
5              Scanner sc = new Scanner(System.in);
6
7              System.out.print("Enter first string: ");
8              String str1 = sc.nextLine();
9
10             System.out.print("Enter second string: ");
11             String str2 = sc.nextLine();
12
13             String result = str1 + str2;
14             System.out.println("Concatenated string: " + result);
```

Console

```
<terminated> string8 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64
Enter first string: raju
Enter second string: gari gadhi
Concatenated string: rajugari gadhi
```

9. Write a program to find the longest word in a string.

string5.java string6.java string7.java string8.java string9.java

```
1  package Stringsprograms;
2  import java.util.Scanner;
3  public class string9 {
4          public static void main(String[] args) {
5              Scanner sc = new Scanner(System.in);
6
7              System.out.print("Enter a sentence: ");
8              String str = sc.nextLine();
9
10             String[] words = str.split(" ");
11             String longest = words[0];
12
13             for (String word : words) {
14                 if (word.length() > longest.length()) {
15                     longest = word;
16                 }
17             }
18
19             System.out.println("Longest word: " + longest);
20         }
21     }
```

Console

```
<terminated> string9 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ec
Enter a sentence: Write a program to find the longest word in a string
Longest word: program
```

10. Write a program to check whether two strings are anagrams or not.

string7.java string8.java string9.java string10.java

```java
package Stringsprograms;
import java.util.Scanner;
public class string10 {
        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter first string: ");
            String str1 = sc.nextLine();

            System.out.print("Enter second string: ");
            String str2 = sc.nextLine();

            if (str1.length() != str2.length()) {
                System.out.println("Not anagrams.");
            } else {
                char[] arr1 = str1.toCharArray();
                char[] arr2 = str2.toCharArray();
                java.util.Arrays.sort(arr1);
                java.util.Arrays.sort(arr2);

                if (java.util.Arrays.equals(arr1, arr2)) {
                    System.out.println("The strings are anagrams.");
                } else {
                    System.out.println("Not anagrams.");
                }
            }
        }
    }
```

Console

```
<terminated> string10 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64
Enter first string: water
Enter second string:  vapour
Not anagrams.
```

11. Write a program to find the first non-repeated character in a string

string8.java string9.java string10.java string11.java

```java
package Stringsprograms;
import java.util.Scanner;
public class string11 {
        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter a string: ");
            String str = sc.nextLine();

            LinkedHashMap<Character, Integer> charCount = new LinkedHas

            for (int i = 0; i < str.length(); i++) {
                char c = str.charAt(i);
                charCount.put(c, charCount.getOrDefault(c, 0) + 1);
            }

            for (char c : charCount.keySet()) {
                if (charCount.get(c) == 1) {
                    System.out.println("First non-repeated character: "
                    return;
                }
            }

            System.out.println("No non-repeated character found.");
        }
    }
```

Console

```
<terminated> string11 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\
Enter a string: string
First non-repeated character: s
```

12. Write a program to check whether a string contains only digits or not.

string8.java | string9.java | string10.java | string11.java

```
1  package Stringsprograms;
2  import java.util.Scanner;
4  public class string11 {
5          public static void main(String[] args) {
6              Scanner sc = new Scanner(System.in);
7
8              System.out.print("Enter a string: ");
9              String str = sc.nextLine();
10
11             LinkedHashMap<Character, Integer> charCount = new LinkedHas
12
13             for (int i = 0; i < str.length(); i++) {
14                 char c = str.charAt(i);
15                 charCount.put(c, charCount.getOrDefault(c, 0) + 1);
16             }
17
18             for (char c : charCount.keySet()) {
19                 if (charCount.get(c) == 1) {
20                     System.out.println("First non-repeated character: "
21                     return;
22                 }
23             }
24
25             System.out.println("No non-repeated character found.");
26         }
27     }
28
```

Console

```
<terminated> string12 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64
Enter a string: 23anna
The string does not contain only digits.
```

13. Write a program to find all permutations of a string

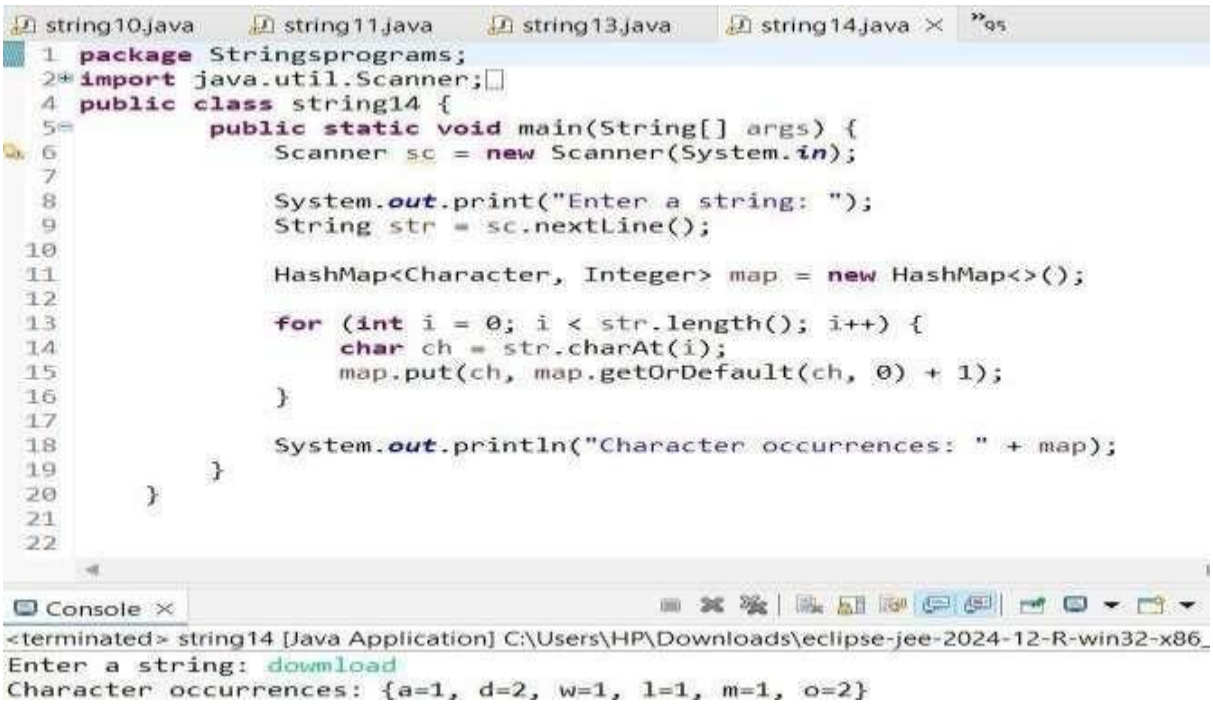
string9.java | string10.java | string11.java | string13.java

```
10             permute(str, 0, str.length() - 1);
11         }
12
13         private static void permute(String str, int l, int r) {
14             if (l == r) {
15                 System.out.println(str);
16             } else {
17                 for (int i = l; i <= r; i++) {
18                     str = swap(str, l, i);
19                     permute(str, l + 1, r);
20                     str = swap(str, l, i);  // Backtrack
21                 }
22             }
23         }
24
25         private static String swap(String str, int i, int j) {
26             char temp;
27             char[] arr = str.toCharArray();
28             temp = arr[i];
29             arr[i] = arr[j];
30             arr[j] = temp;
31             return new String(arr);
32         }
33     }
34
35
36
```

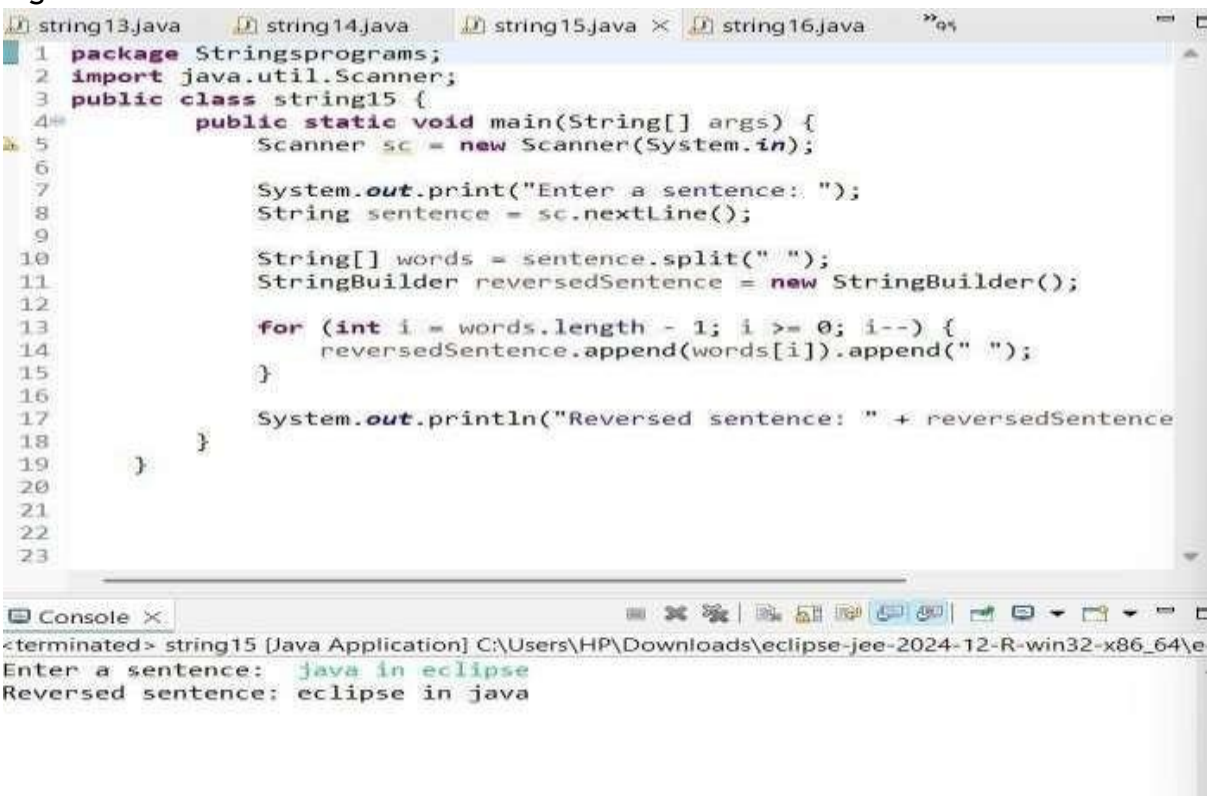
Console

```
<terminated> string13 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64
Enter a string: eat
eat
eta
aet
ate
tae
tea
```

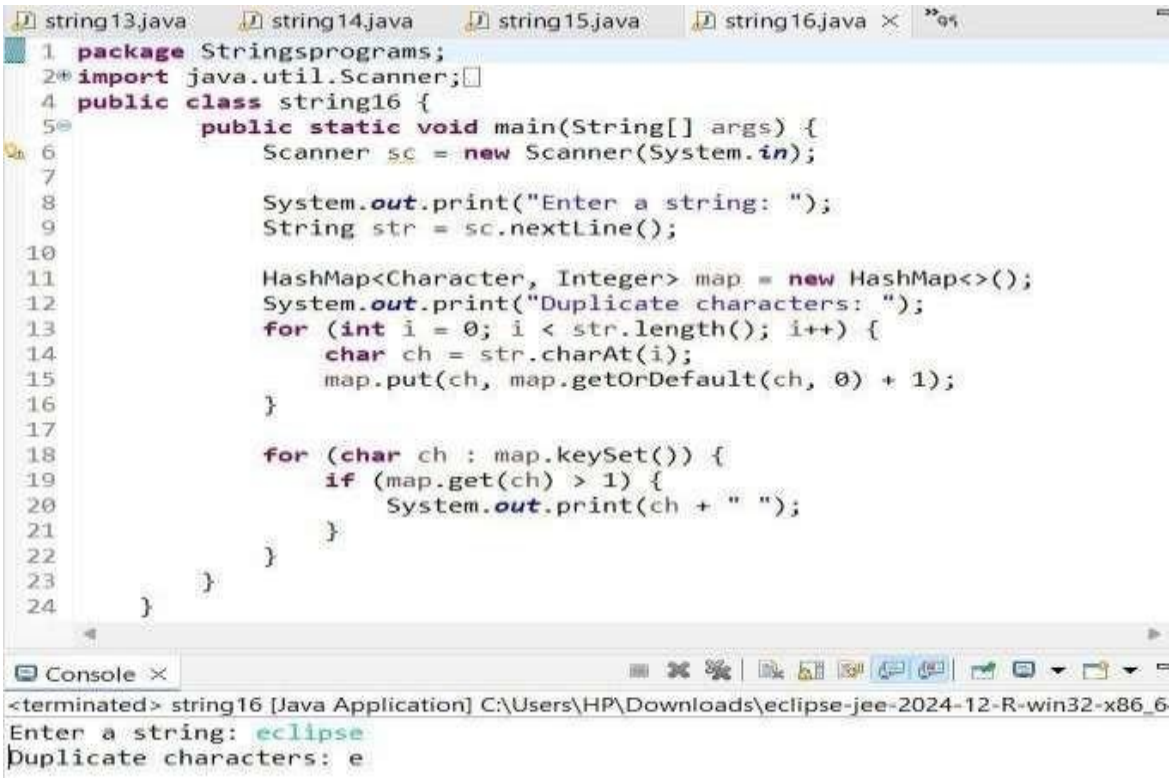
18. Write a program to find the words in of each character in a string.



15. Write a program to reverse words a sentence.



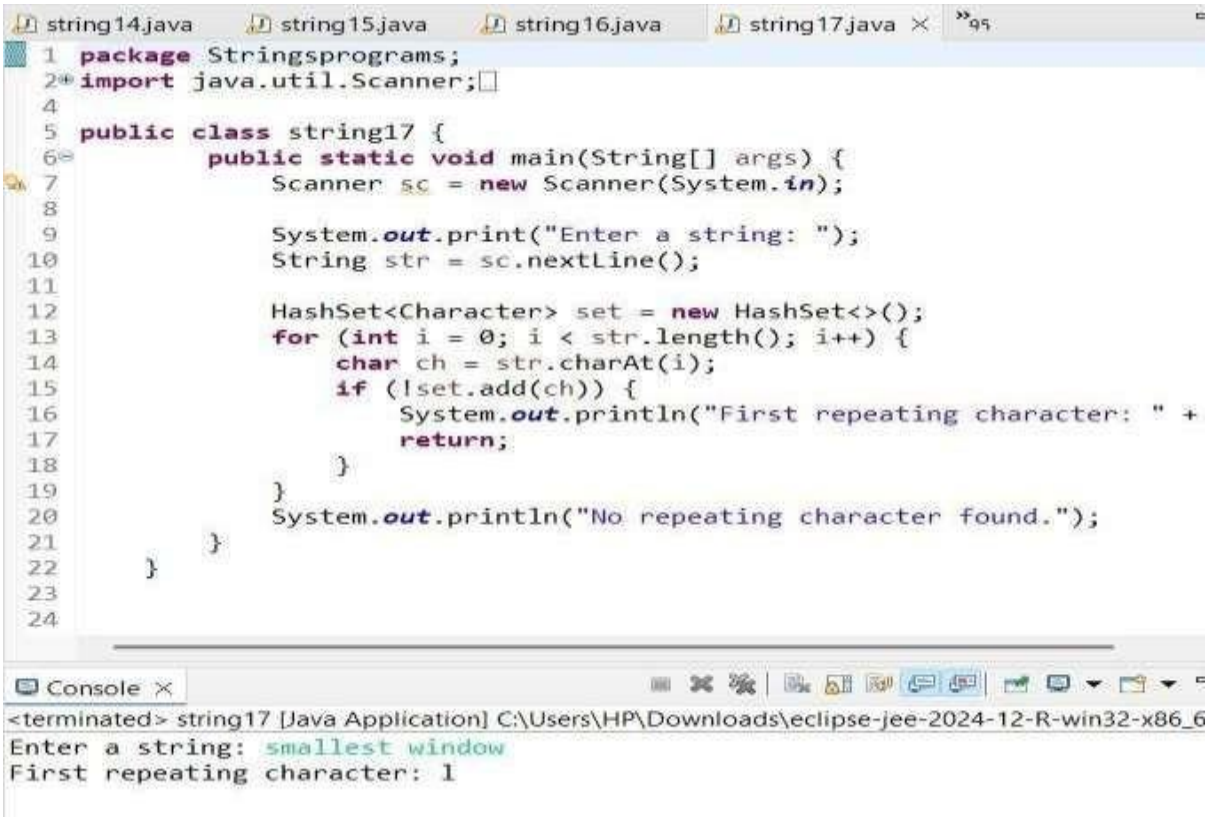
18. Write a program to find the duplicate characters in a string.



```
string13.java  string14.java  string15.java  string16.java ×
 1 package Stringsprograms;
 2 import java.util.Scanner;
 4 public class string16 {
 5         public static void main(String[] args) {
 6             Scanner sc = new Scanner(System.in);
 7
 8             System.out.print("Enter a string: ");
 9             String str = sc.nextLine();
10
11             HashMap<Character, Integer> map = new HashMap<>();
12             System.out.print("Duplicate characters: ");
13             for (int i = 0; i < str.length(); i++) {
14                 char ch = str.charAt(i);
15                 map.put(ch, map.getOrDefault(ch, 0) + 1);
16             }
17
18             for (char ch : map.keySet()) {
19                 if (map.get(ch) > 1) {
20                     System.out.print(ch + " ");
21                 }
22             }
23         }
24     }
```

```
Console ×
<terminated> string16 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_6
Enter a string: eclipse
Duplicate characters: e
```

18. Write a program to find the first repeating character in a string.



```
string14.java  string15.java  string16.java  string17.java ×
 1 package Stringsprograms;
 2 import java.util.Scanner;
 4
 5 public class string17 {
 6         public static void main(String[] args) {
 7             Scanner sc = new Scanner(System.in);
 8
 9             System.out.print("Enter a string: ");
10             String str = sc.nextLine();
11
12             HashSet<Character> set = new HashSet<>();
13             for (int i = 0; i < str.length(); i++) {
14                 char ch = str.charAt(i);
15                 if (!set.add(ch)) {
16                     System.out.println("First repeating character: " +
17                     return;
18                 }
19             }
20             System.out.println("No repeating character found.");
21         }
22     }
23
24
```

```
Console ×
<terminated> string17 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_6
Enter a string: smallest window
First repeating character: l
```

18 Write a program to capitalize the first letter of each word in a sentence.

string15.java string16.java string17.java string18.java

```
1  package Stringsprograms;
2  import java.util.Scanner;
3  public class string18 {
4          public static void main(String[] args) {
5              Scanner sc = new Scanner(System.in);
6
7              System.out.print("Enter a sentence: ");
8              String sentence = sc.nextLine();
9
10             String[] words = sentence.split(" ");
11             StringBuilder capitalizedSentence = new StringBuilder();
12
13             for (String word : words) {
14                 capitalizedSentence.append(word.substring(0, 1).toUpper
15             }
16
17             System.out.println("Capitalized sentence: " + capitalizedS
18         }
19     }
20
21
22
```

Console

```
<terminated> string18 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_6
Enter a sentence: check whether a string is a rotation
Capitalized sentence: Check Whether A String Is A Rotation
```

19. Write a program to check whether a string is a rotation of another string.

string15.java string17.java string18.java string19.java

```
1  package Stringsprograms;
2  import java.util.Scanner;
3  public class string19 {
4          public static void main(String[] args) {
5              Scanner sc = new Scanner(System.in);
6
7              System.out.print("Enter first string: ");
8              String str1 = sc.nextLine();
9
10             System.out.print("Enter second string: ");
11             String str2 = sc.nextLine();
12
13             if (str1.length() != str2.length()) {
14                 System.out.println("Strings are not rotations of eac
15             } else {
16                 String temp = str1 + str1;
17                 if (temp.contains(str2)) {
18                     System.out.println("The second string is a rotat
19                 } else {
20                     System.out.println("Strings are not rotations of
21                 }
22             }
23         }
```

Console

```
<terminated> string19 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x8
Enter first string: papa
Enter second string: maa
Strings are not rotations of each other.
```

20. Write a program to check whether a string is a substring of another string.

```java
package Stringsprograms;
import java.util.Scanner;
public class string20 {
        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter first string: ");
            String str1 = sc.nextLine();

            System.out.print("Enter second string: ");
            String str2 = sc.nextLine();

            if (str1.contains(str2)) {
                System.out.println("The second string is a substring of
            } else {
                System.out.println("The second string is not a substrin
            }
        }
    }
```

```
<terminated> string20 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\e
Enter first string: user
Enter second string: name
The second string is not a substring of the first string.
```

21. Write a program to remove duplicates from a string.

```java
package Stringsprograms;
import java.util.Scanner;

public class string21 {
        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter a string: ");
            String str = sc.nextLine();

            LinkedHashSet<Character> set = new LinkedHashSet<>();
            for (char c : str.toCharArray()) {
                set.add(c);
            }

            StringBuilder result = new StringBuilder();
            for (char c : set) {
                result.append(c);
            }

            System.out.println("String without duplicates: " + result.t
        }
    }
```

```
<terminated> string21 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_6
Enter a string: bottle
String without duplicates: botle
```

22. Write a program to find the common characters in two given strings.

```java
package Stringsprograms;
import java.util.Scanner;
public class string22 {
        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter first string: ");
            String str1 = sc.nextLine();

            System.out.print("Enter second string: ");
            String str2 = sc.nextLine();

            HashSet<Character> set1 = new HashSet<>();
            HashSet<Character> set2 = new HashSet<>();
            for (char c : str1.toCharArray()) {
                set1.add(c);
            }

            for (char c : str2.toCharArray()) {
                set2.add(c);
            }

            set1.retainAll(set2);
```

```
<terminated> string22 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x
Enter first string: girl
Enter second string: boy
Common characters: []
```

23. Write a program to check whether a given string is a pangram or not.

```java
package Stringsprograms;
import java.util.Scanner;
public class string23 {
        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter a string: ");
            String str = sc.nextLine().toLowerCase();

            boolean[] alphabet = new boolean[26];
            int index = 0;

            for (int i = 0; i < str.length(); i++) {
                if (str.charAt(i) >= 'a' && str.charAt(i) <= 'z') {
                    index = str.charAt(i) - 'a';
                    alphabet[index] = true;
                }
            }

            boolean isPangram = true;
            for (int i = 0; i < 26; i++) {
                if (!alphabet[i]) {
                    isPangram = false;
```

```
<terminated> string23 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\
Enter a string: smart
The string is not a pangram.
```

24. Write a program to find the smallest window in a string containing all characters of another string.

```java
package Stringsprograms;
import java.util.Scanner;
public class string24 {
        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter first string: ");
            String str1 = sc.nextLine();

            System.out.print("Enter second string: ");
            String str2 = sc.nextLine();

            System.out.println("Smallest window: " + smallestWindow(str
        }

        public static String smallestWindow(String str1, String str2) {
            if (str1.length() < str2.length()) {
                return "No such window";
            }

            int[] count = new int[256];
            for (int i = 0; i < str2.length(); i++) {
                count[str2.charAt(i)]++;
```

```
<terminated> string24 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecl
Enter first string: plugins
Enter second string: in java
Smallest window: No such window
```

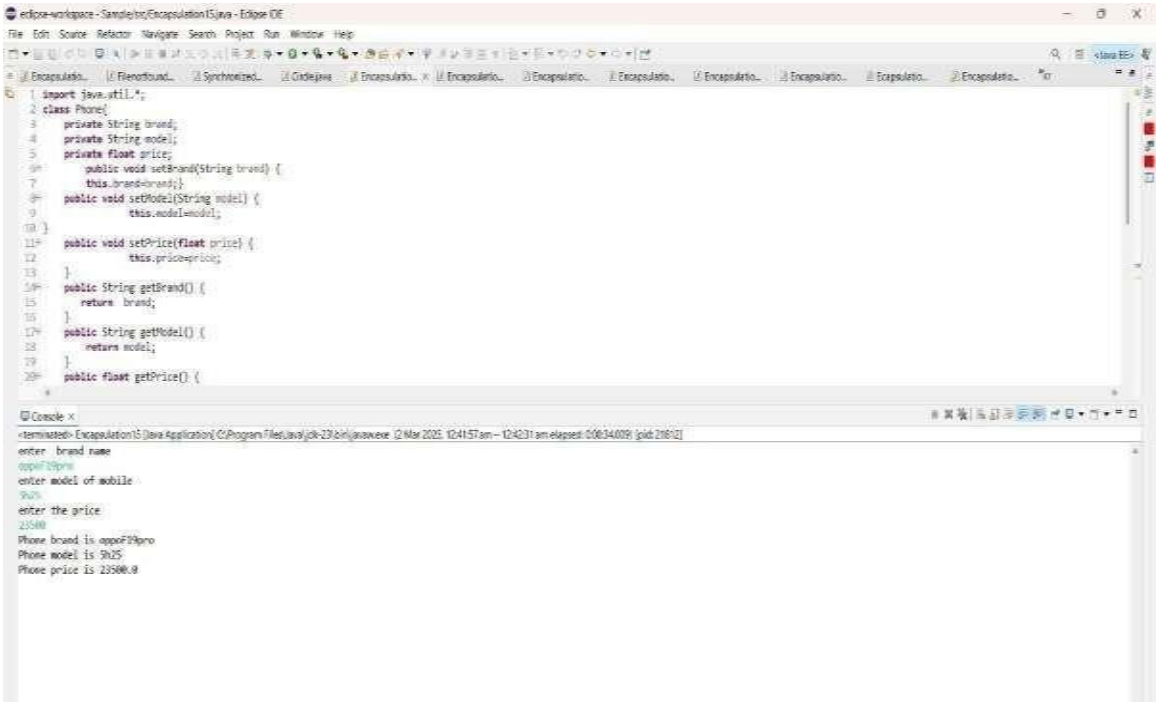
25. Write a program to find the longest common prefix among an array of strings.

```java
package Stringsprograms;
import java.util.Scanner;
public class string25 {
        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter the number of strings: ")
            int n = sc.nextInt();
            sc.nextLine();  // Consume newline

            String[] strArray = new String[n];

            System.out.println("Enter the strings:");
            for (int i = 0; i < n; i++) {
                strArray[i] = sc.nextLine();
            }

            System.out.println("Longest common prefix: " + lc
        }

        public static String longestCommonPrefix(String[] str
            if (strs == null || strs.length == 0) {
                return "";
```

```
<terminated> string25 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R
Enter the number of strings: 2
Enter the strings:
backspace
```

Encapsulation

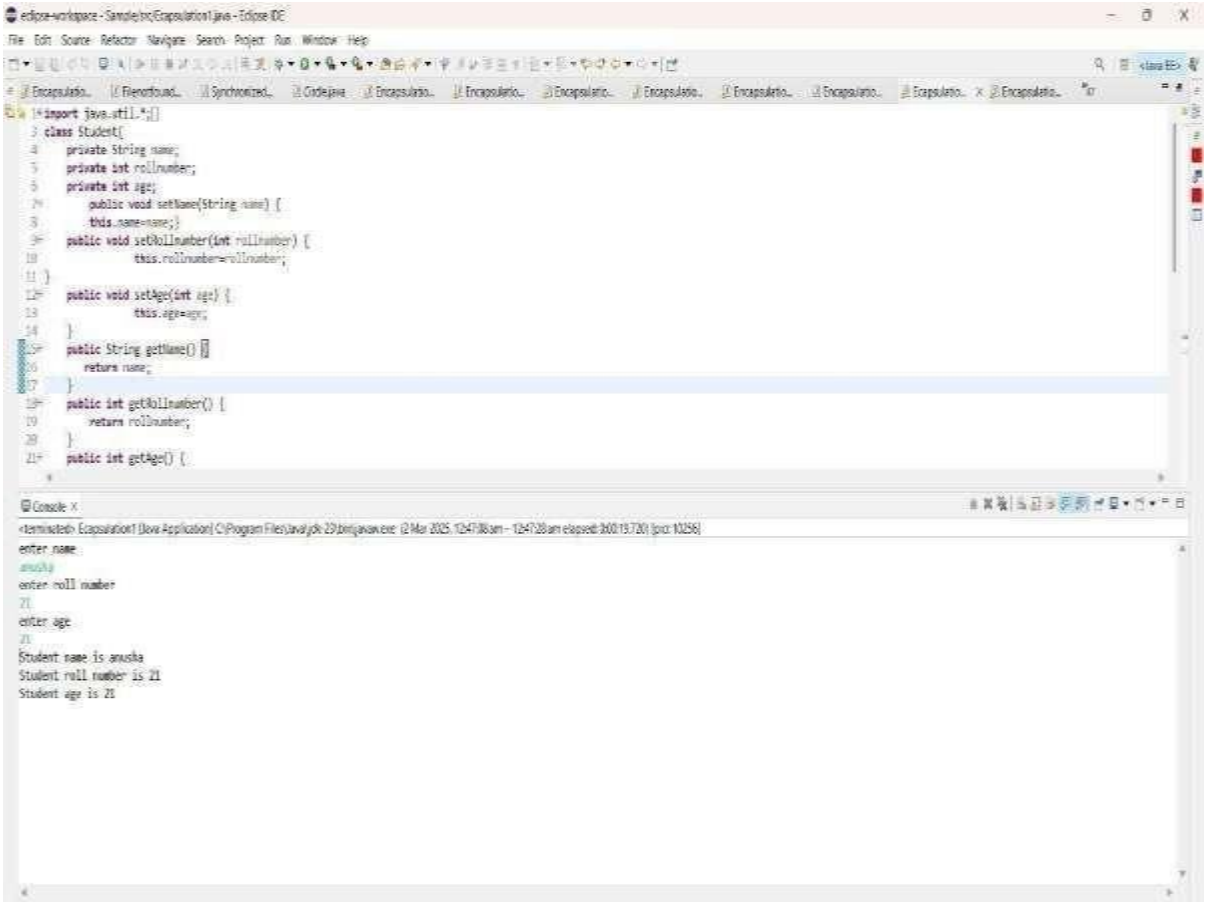
1.create a class representing student with private member variables (name, roll number, age) and public methods (getters and setters).



```
import java.util.*;
class Phone{
    private String brand;
    private String model;
    private float price;
        public void setBrand(String brand) {
        this.brand=brand;}
    public void setModel(String model) {
            this.model=model;
}
    public void setPrice(float price) {
            this.price=price;
    }
    public String getBrand() {
      return  brand;
    }
    public String getModel() {
        return model;
    }
    public float getPrice() {
```

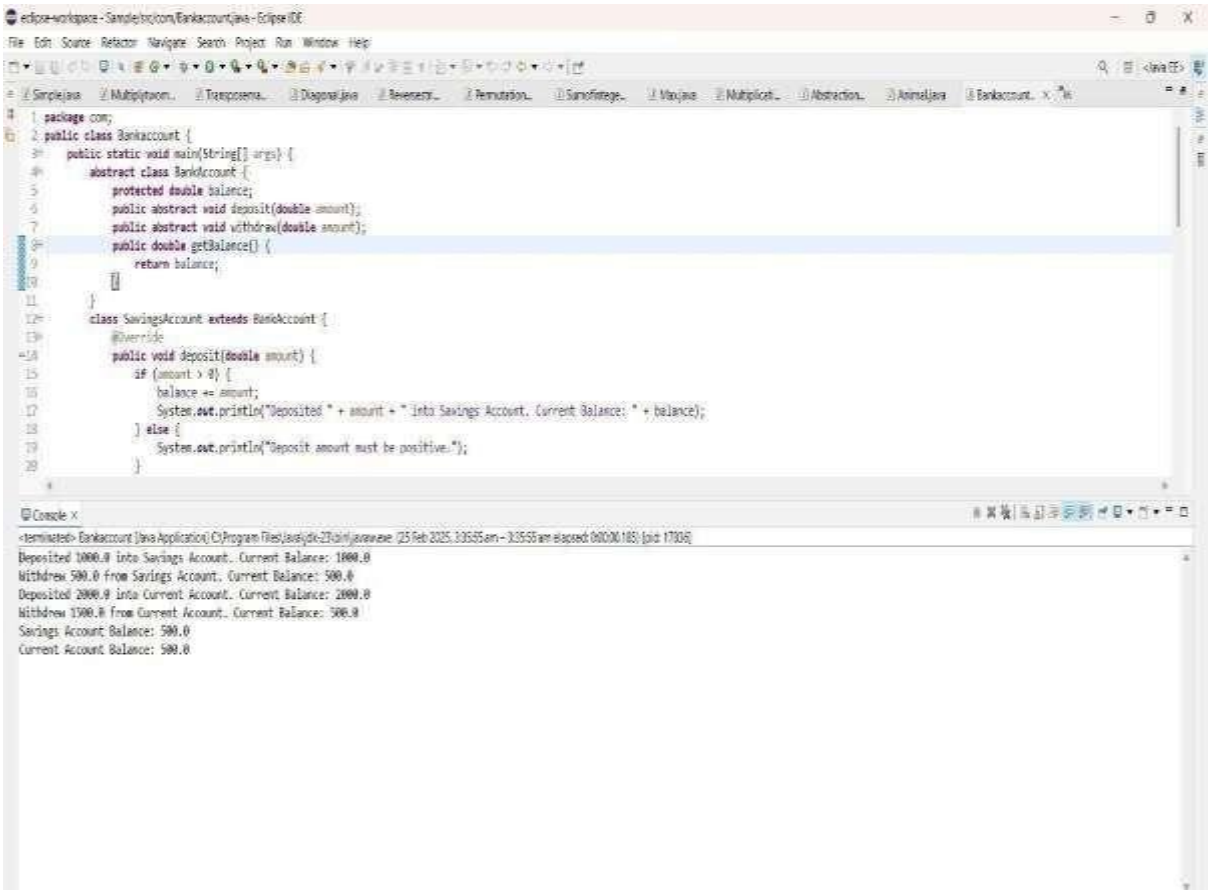
```
enter  brand name
oppoF19pro
enter model of mobile
9h25
enter the price
23500
Phone brand is oppoF19pro
Phone model is 9h25
Phone price is 23500.0
```

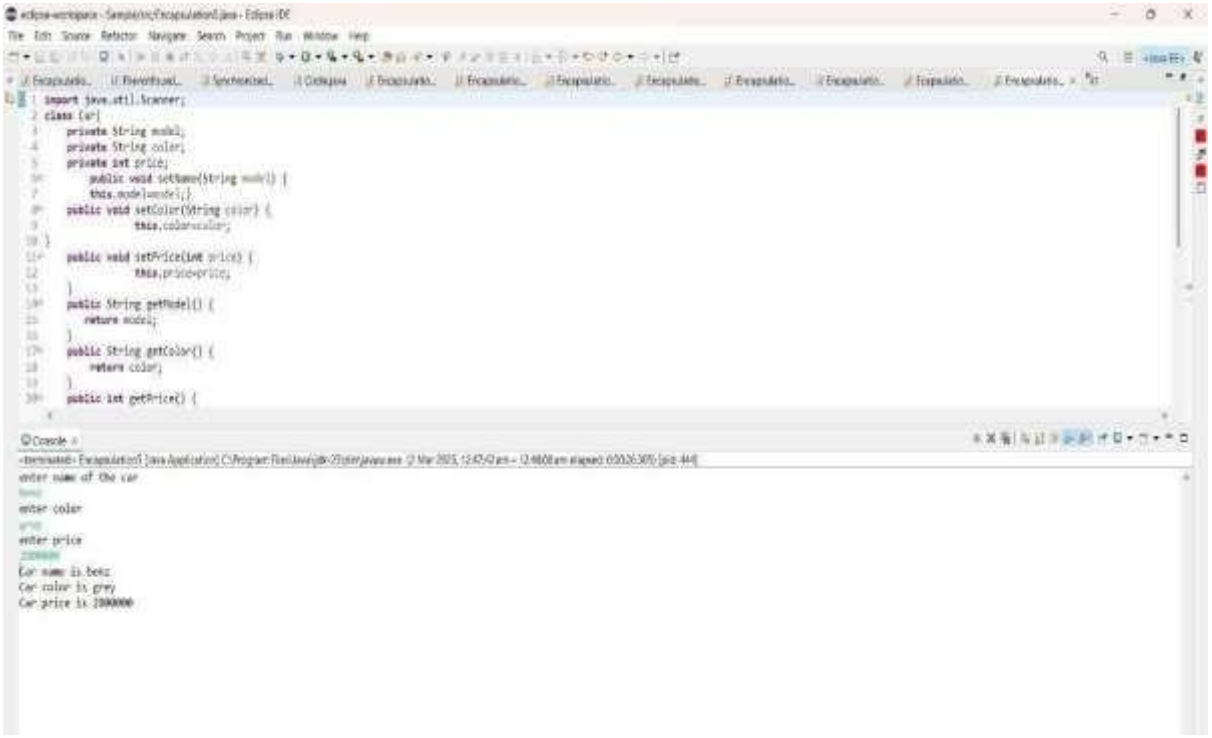
2. Write a program to demonstrate encapsulation by accessing private member variables Through public accessor methods.



```
import java.util.*;
class Student{
    private String name;
    private int rollnumber;
    private int age;
        public void setName(String name) {
        this.name=name;}
    public void setRollnumber(int rollnumber) {
            this.rollnumber=rollnumber;
}
    public void setAge(int age) {
            this.age=age;
    }
    public String getName() {
      return name;
    }
    public int getRollnumber() {
        return rollnumber;
    }
    public int getAge() {
```

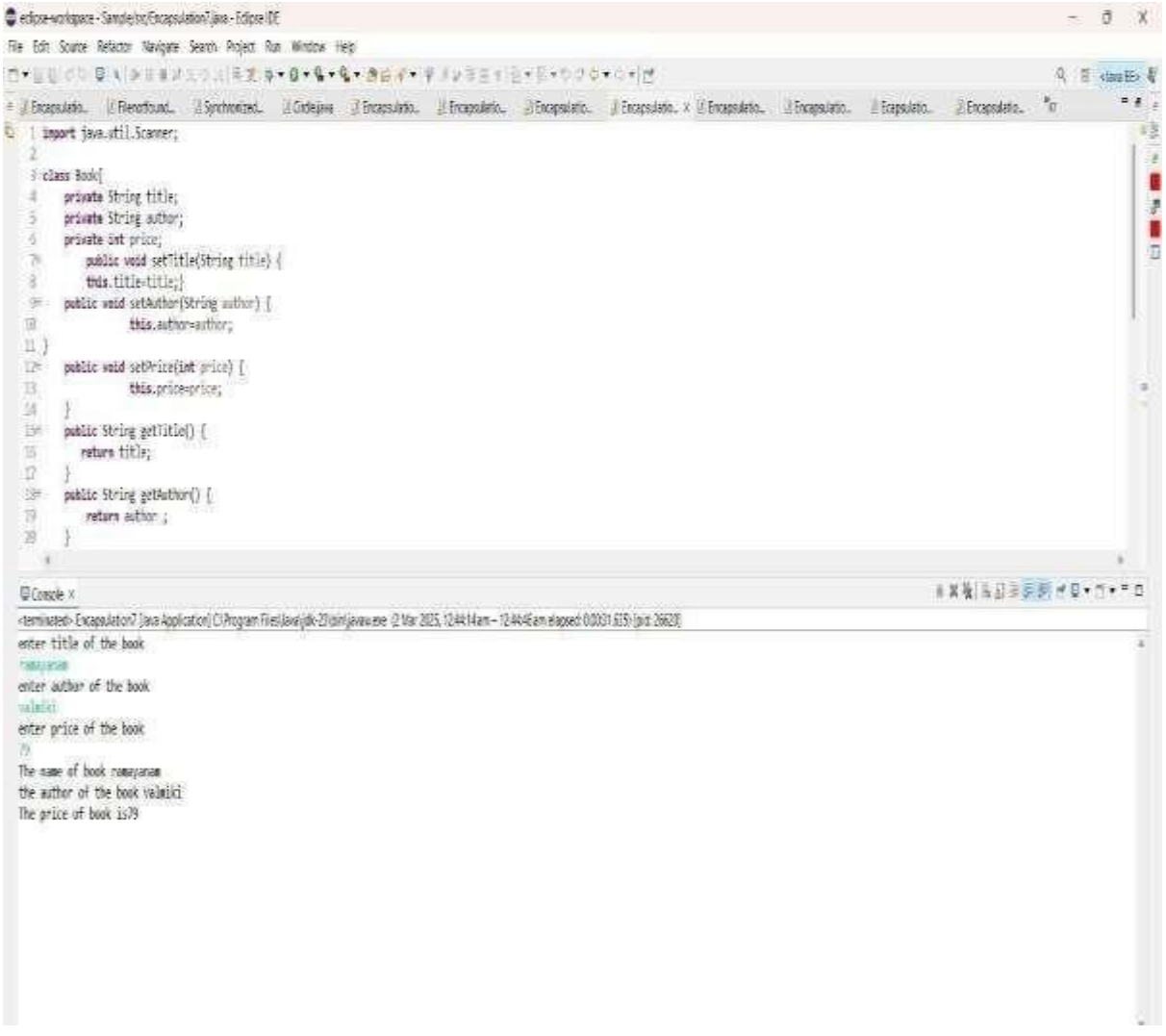
```
enter name
anuska
enter roll number
21
enter age
21
Student name is anuska
Student roll number is 21
Student age is 21
```


eclipse-workspace - Sample/src/com/Bankaccount.java - Eclipse IDE
File Edit Source Refactor Navigate Search Project Run Window Help
Simple.java
Multiplytwom...
Transposema...
Diagonal.java
Reverserv...
Permutation...
Sumofintege...
Max.java
Multiplicat...
Abstraction...
Animal.java
Bankaccount...
1 package com;
2 public class Bankaccount {
3 public static void main(String[] args) {
4 abstract class BankAccount {
5 protected double balance;
6 public abstract void deposit(double amount);
7 public abstract void withdraw(double amount);
8 public double getBalance() {
9 return balance;
10 }
11 }
12 class SavingsAccount extends BankAccount {
13 @Override
14 public void deposit(double amount) {
15 if (amount > 0) {
16 balance += amount;
17 System.out.println("Deposited " + amount + " into Savings Account. Current Balance: " + balance);
18 } else {
19 System.out.println("Deposit amount must be positive.");
20 }
Console
<terminated> Bankaccount [Java Application] C:\Program Files\Java\jdk-23\bin\javaw.exe (25 Feb 2025, 3:35:55 am – 3:35:55 am elapsed: 0:00:00.183) [pid: 17304]
Deposited 1000.0 into Savings Account. Current Balance: 1000.0
Withdrew 500.0 from Savings Account. Current Balance: 500.0
Deposited 2000.0 into Current Account. Current Balance: 2000.0
Withdrew 1500.0 from Current Account. Current Balance: 500.0
Savings Account Balance: 500.0
Current Account Balance: 500.0



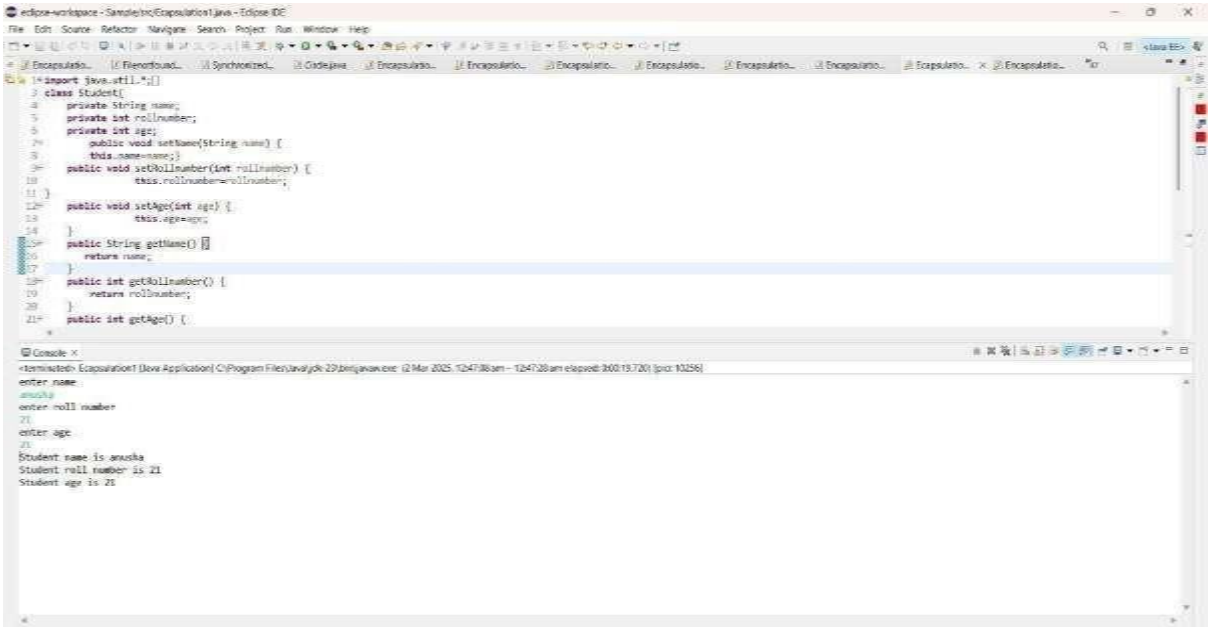
```
import java.util.Scanner;
class Car{
    private String model;
    private String color;
    private int price;
        public void setName(String model) {
        this.model=model;}
    public void setColor(String color) {
                this.color=color;
}
    public void setPrice(int price) {
                this.price=price;
    }
    public String getModel() {
       return model;
    }
    public String getColor() {
        return color;
    }
    public int getPrice() {
```

```
enter name of the car
benz
enter color
grey
enter price
1000000
Car name is benz
Car color is grey
Car price is 1000000
```



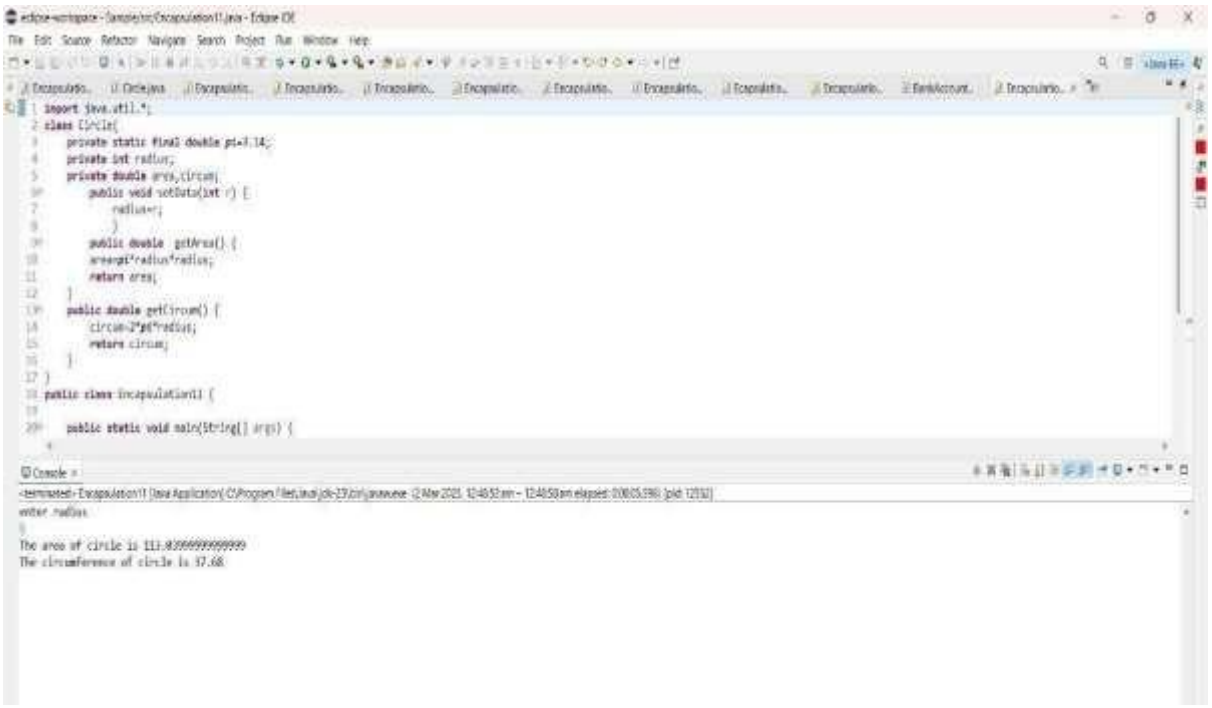
```
import java.util.Scanner;

class Book{
    private String title;
    private String author;
    private int price;
        public void setTitle(String title) {
        this.title=title;}
    public void setAuthor(String author) {
                this.author=author;
}
    public void setPrice(int price) {
                this.price=price;
    }
    public String getTitle() {
       return title;
    }
    public String getAuthor() {
        return author ;
    }
```

```
enter title of the book
ramayanam
enter author of the book
valmiki
enter price of the book
79
The name of book ramayanam
the author of the book valmiki
The price of book is79
```



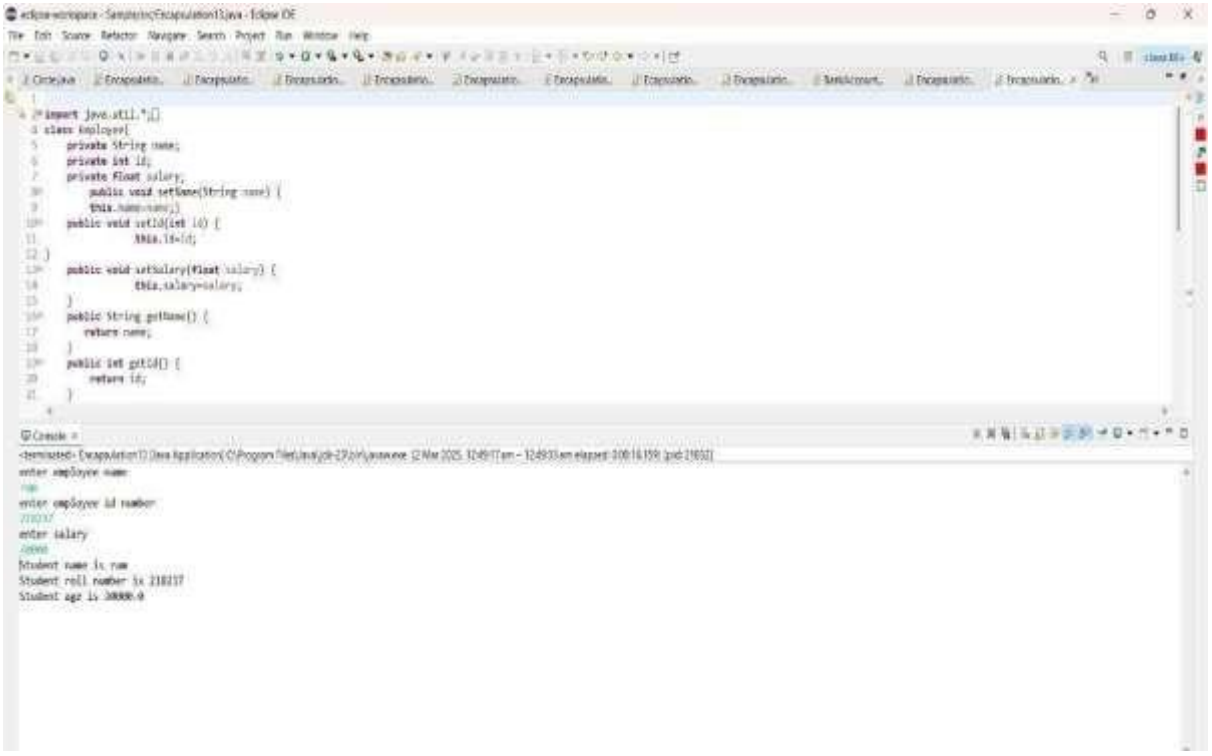
```
import java.util.*;
class Student{
    private String name;
    private int rollnumber;
    private int age;
        public void setName(String name) {
        this.name=name;}
    public void setRollnumber(int rollnumber) {
                this.rollnumber=rollnumber;
}
    public void setAge(int age) {
                this.age=age;
    }
    public String getName() {
        return name;
    }
    public int getRollnumber() {
        return rollnumber;
    }
    public int getAge() {
```

```
enter name
anuska
enter roll number
21
enter age
21
Student name is anuska
Student roll number is 21
Student age is 21
```



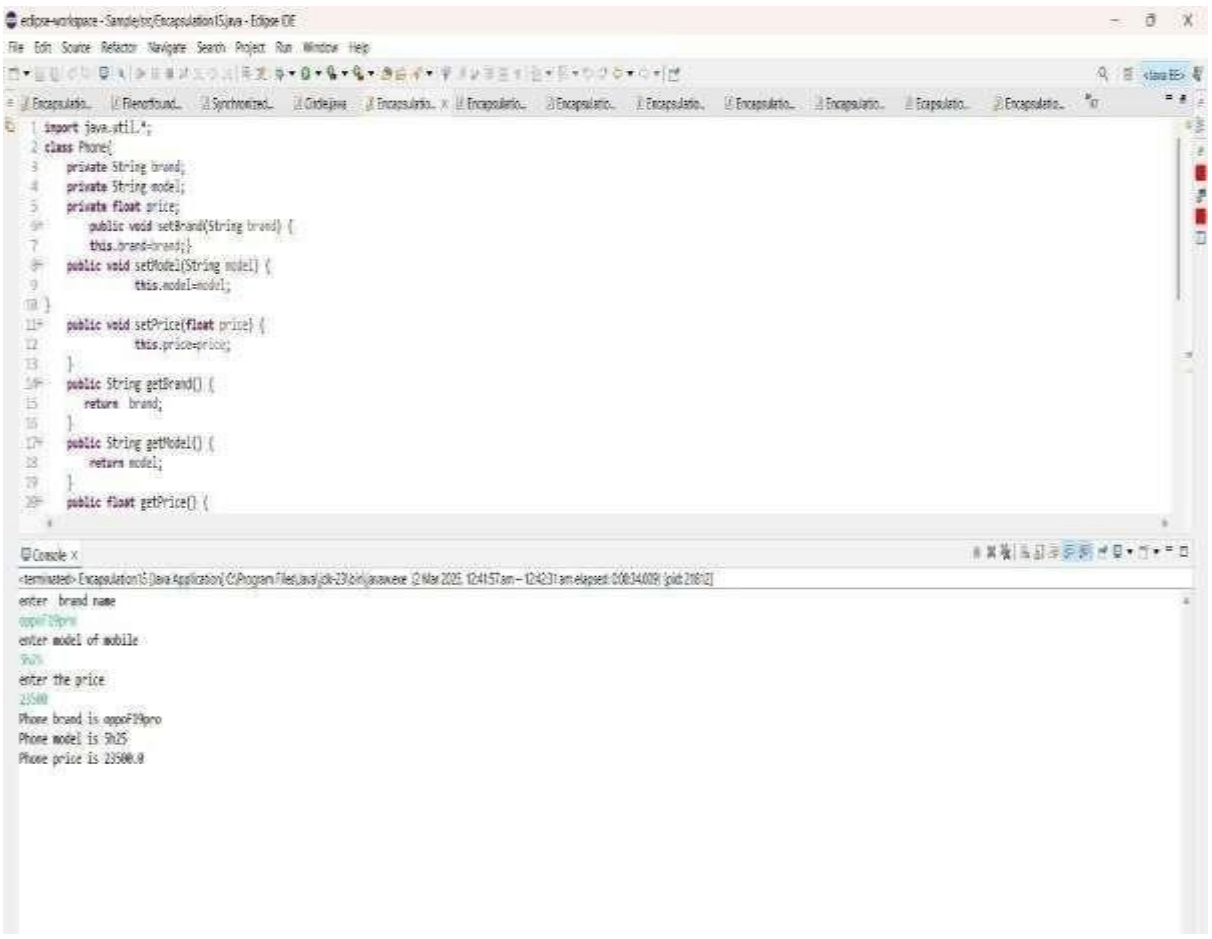
```
import java.util.*;
class Circle{
    private static final double pi=3.14;
    private int radius;
    private double area,circum;
        public void setData(int r) {
            radius=r;
            }
        public double  getArea() {
        area=pi*radius*radius;
        return area;
    }
    public double getCircum() {
        circum=2*pi*radius;
        return circum;
    }
}
public class Encapsulation11 {

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

```
enter radius
5
The area of circle is 111.83999999999999
The circumference of circle is 17.68
```



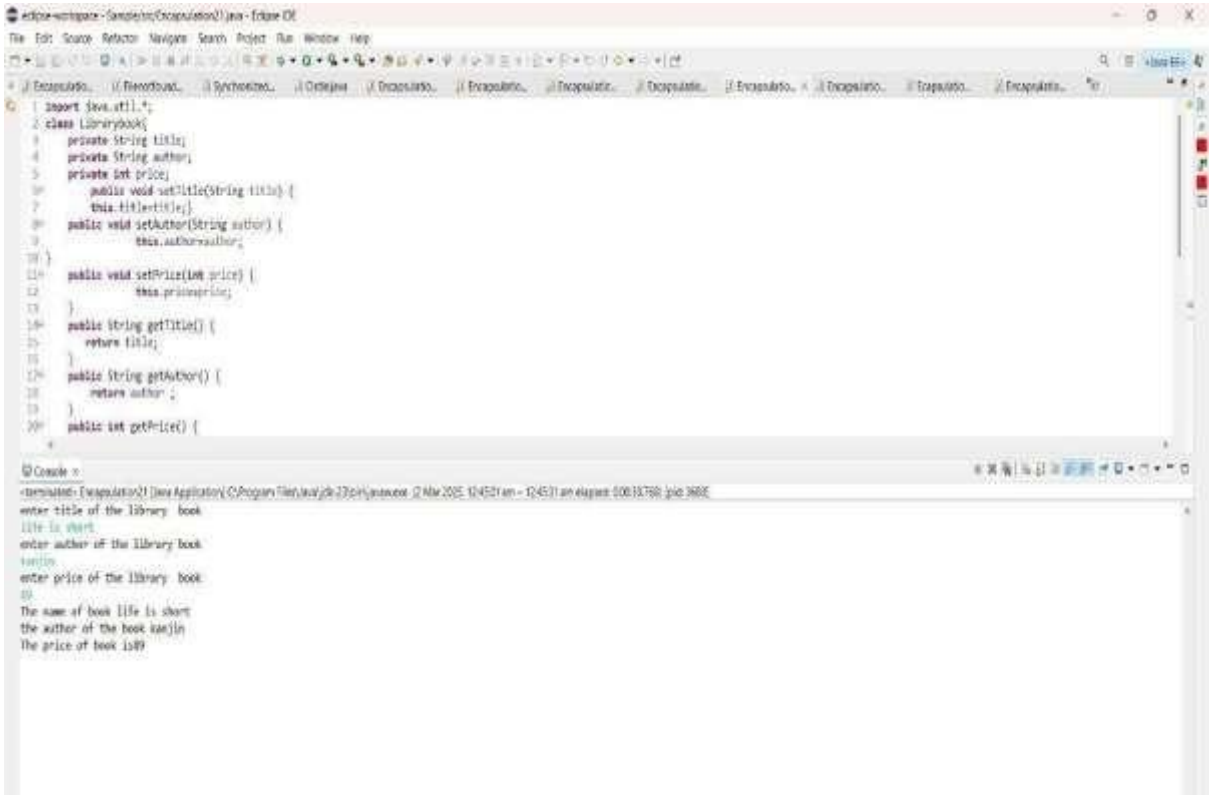
```
/*import java.util.*;
class Employee{
    private String name;
    private int id;
    private float salary;
        public void setName(String name) {
        this.name=name;}
    public void setId(int id) {
                this.id=id;
}
    public void setSalary(float salary) {
                this.salary=salary;
    }
    public String getName() {
       return name;
    }
    public int getId() {
        return id;
    }
```

```
Console ×
<terminated> Encapsulation1 [Java Application] C:\Program Files\Java\jdk-23\bin\javaw.exe (2 Mar 2025, 12:49:17 am – 12:49:33 am elapsed: 0:00:16.159) [pid: 21692]
enter employee name
rue
enter employee id number
218237
enter salary
30000
Student name is rue
Student roll number is 218237
Student age is 30000.0
```



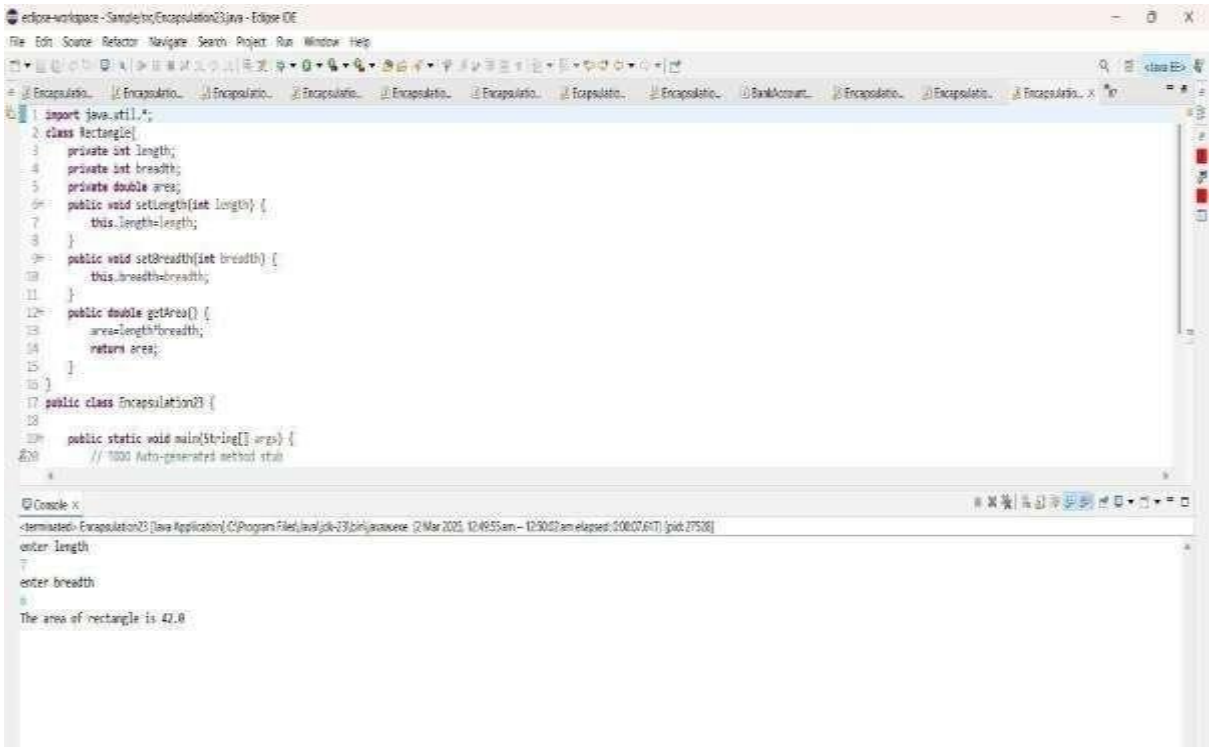
```
import java.util.*;
class Phone{
    private String brand;
    private String model;
    private float price;
        public void setBrand(String brand) {
        this.brand=brand;}
    public void setModel(String model) {
                this.model=model;
}
    public void setPrice(float price) {
                this.price=price;
    }
    public String getBrand() {
       return  brand;
    }
    public String getModel() {
        return model;
    }
    public float getPrice() {
```

```
Console ×
<terminated> Encapsulation15 [Java Application] C:\Program Files\Java\jdk-23\bin\javaw.exe (2 Mar 2025, 12:41:57 am – 12:42:31 am elapsed: 0:00:34.009) [pid: 21612]
enter  brand name
oppoF19pro
enter model of mobile
Sh25
enter the price
23500
Phone brand is oppoF19pro
Phone model is Sh25
Phone price is 23500.0
```



```
import java.util.*;
class Librarybook{
    private String title;
    private String author;
    private int price;
        public void setTitle(String title) {
        this.title=title;}
    public void setAuthor(String author) {
                this.author=author;
}
    public void setPrice(int price) {
                this.price=price;
    }
    public String getTitle() {
       return title;
    }
    public String getAuthor() {
        return author ;
    }
    public int getPrice() {
```

```
<terminated> Encapsulation21 [Java Application] C:\Program Files\Java\jdk-23\bin\javaw.exe (2 Mar 2025, 12:45:21 am – 12:45:31 am elapsed: 0:00:10.758) [pid: 3680]
enter title of the library  book
life is short
enter author of the library book
ranjin
enter price of the library  book
89
The name of book life is short
the author of the book ranjin
The price of book is89
```

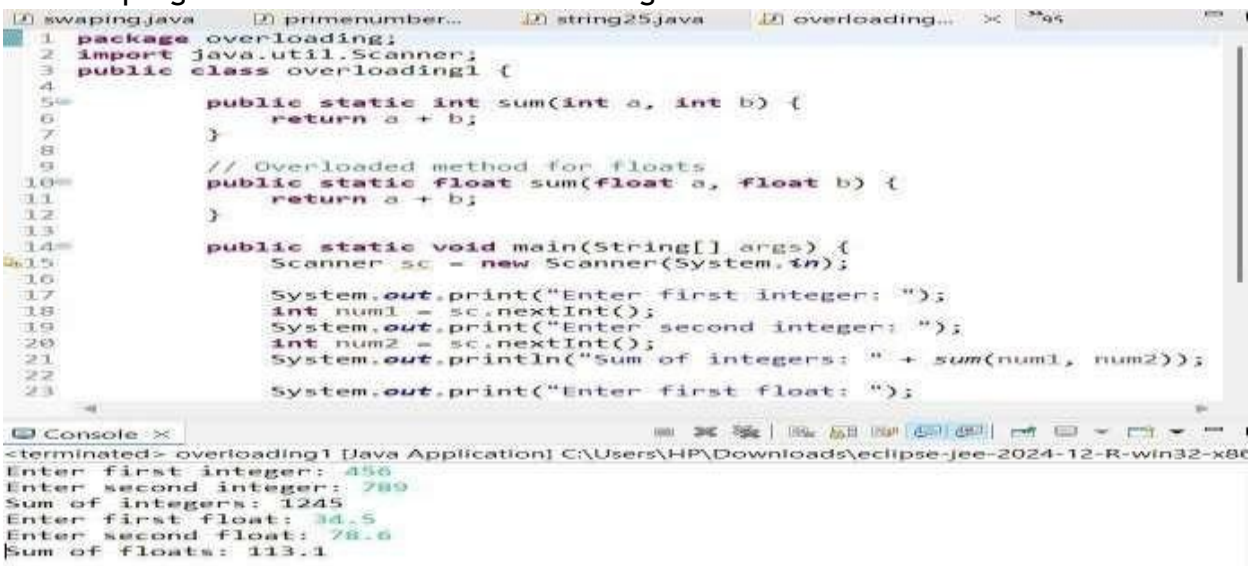


```
import java.util.*;
class Rectangle{
    private int length;
    private int breadth;
    private double area;
    public void setLength(int length) {
        this.length=length;
    }
    public void setBreadth(int breadth) {
        this.breadth=breadth;
    }
    public double getArea() {
        area=length*breadth;
        return area;
    }
}
public class Encapsulation23 {

    public static void main(String[] args) {
        // TODO Auto-generated method stub
```

```
<terminated> Encapsulation23 [Java Application] C:\Program Files\Java\jdk-23\bin\javaw.exe (2 Mar 2025, 12:49:55 am – 12:50:02 am elapsed: 0:00:07.647) [pid: 27508]
enter length
7
enter breadth
6
The area of rectangle is 42.0
```

OVERLOADING

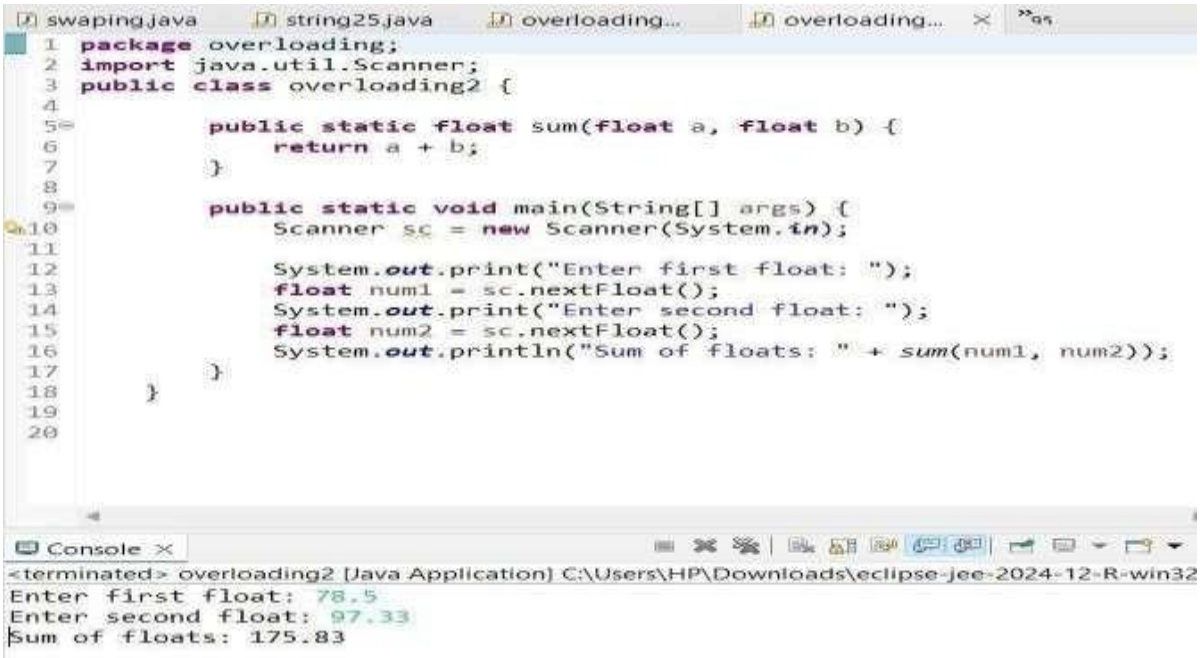
1. Write a program to find the sum of two integers.



```
package overloading;
import java.util.Scanner;
public class overloading1 {

        public static int sum(int a, int b) {
            return a + b;
        }

        // Overloaded method for floats
        public static float sum(float a, float b) {
            return a + b;
        }

        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter first integer: ");
            int num1 = sc.nextInt();
            System.out.print("Enter second integer: ");
            int num2 = sc.nextInt();
            System.out.println("Sum of integers: " + sum(num1, num2));

            System.out.print("Enter first float: ");
```

```
Console
<terminated> overloading1 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86
Enter first integer: 456
Enter second integer: 789
Sum of integers: 1245
Enter first float: 34.5
Enter second float: 78.6
Sum of floats: 113.1
```

2. Write a program to find the sum of two floats.



```
package overloading;
import java.util.Scanner;
public class overloading2 {

        public static float sum(float a, float b) {
            return a + b;
        }

        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter first float: ");
            float num1 = sc.nextFloat();
            System.out.print("Enter second float: ");
            float num2 = sc.nextFloat();
            System.out.println("Sum of floats: " + sum(num1, num2));
        }
    }
```

```
Console
<terminated> overloading2 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32
Enter first float: 78.5
Enter second float: 97.33
Sum of floats: 175.83
```

3. Write a program to find the area of a rectangle.

```java
public class overloading3 {

        // Overloaded method for integer dimensions
        public static int area(int length, int width) {
            return length * width;
        }

        // Overloaded method for float dimensions
        public static float area(float length, float width) {
            return length * width;
        }

        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter length of rectangle (integer): ");
            int length1 = sc.nextInt();
            System.out.print("Enter width of rectangle (integer): ");
            int width1 = sc.nextInt();
            System.out.println("Area of rectangle: " + area(length1, wi

            System.out.print("Enter length of rectangle (float): ");
            float length2 = sc.nextFloat();
            System.out.print("Enter width of rectangle (float): ");
```

```
<terminated> overloading3 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_
Enter length of rectangle (integer): 74
Enter width of rectangle (integer): 963
Area of rectangle: 71262
Enter length of rectangle (float): 4.8
Enter width of rectangle (float): 6.77
Area of rectangle: 32.496002
```

4. Write a program to find the volume of a cylinder.

```java
package overloading;
import java.util.Scanner;
public class overloading4 {

        public static double volume(int radius, int height) {
            return Math.PI * Math.pow(radius, 2) * height;
        }

        // Overloaded method for float radius and height
        public static double volume(float radius, float height) {
            return Math.PI * Math.pow(radius, 2) * height;
        }

        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter radius of cylinder (integer): ");
            int radius1 = sc.nextInt();
            System.out.print("Enter height of cylinder (integer): ");
            int height1 = sc.nextInt();
            System.out.println("Volume of cylinder: " + volume(radius1,

            System.out.print("Enter radius of cylinder (float): ");
            float radius2 = sc.nextFloat();
```

```
<terminated> overloading4 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x
Enter radius of cylinder (integer): 14
Enter height of cylinder (integer): 23
Volume of cylinder: 14162.299682382787
Enter radius of cylinder (float): 74.5
Enter height of cylinder (float): 94.2
Volume of cylinder: 1642529.9865179162
```

5. Write a program to calculate the factorial of a number.

```java
import java.util.Scanner;
public class overloading5 {

        public static int factorial(int n) {
            int fact = 1;
            for (int i = 1; i <= n; i++) {
                fact *= i;
            }
            return fact;
        }

        // Method for long factorial
        public static long factorial(long n) {
            long fact = 1;
            for (long i = 1; i <= n; i++) {
                fact *= i;
            }
            return fact;
        }

        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter an integer to find factorial: ");
```

```
<terminated> overloading5 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_
Enter an integer to find factorial: 6
Factorial of 6: 720
```

6. Write a program to find the average of three numbers

```java
package overloading;
import java.util.Scanner;
public class overloading6 {

        public static double average(int a, int b, int c) {
            return (a + b + c) / 3.0;
        }

        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter first number: ");
            int num1 = sc.nextInt();
            System.out.print("Enter second number: ");
            int num2 = sc.nextInt();
            System.out.print("Enter third number: ");
            int num3 = sc.nextInt();

            System.out.println("Average of three numbers: " + average(n
        }
    }
```

```
<terminated> overloading6 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_
Enter first number: 45
Enter second number: 12
Enter third number: 23
Average of three numbers: 26.666666666666668
```

7. Write a program to find the maximum of two numbers.

```java
package overloading;
import java.util.Scanner;
public class overloading7 {
        public static int max(int a, int b) {
            return (a > b) ? a : b;
        }

        public static float max(float a, float b) {
            return (a > b) ? a : b;
        }

        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter first integer: ");
            int int1 = sc.nextInt();
            System.out.print("Enter second integer: ");
            int int2 = sc.nextInt();
            System.out.println("Maximum of two integers: " + max(int1,

            System.out.print("Enter first float: ");
            float float1 = sc.nextFloat();
            System.out.print("Enter second float: ");
            float float2 = sc.nextFloat();
```

```
<terminated> overloading7 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_
Enter first integer: 58
Enter second integer: 54
Maximum of two integers: 58
Enter first float: 78945
Enter second float: 12398.12575
Maximum of two floats: 78945.0
```

8. Write a program to find the minimum of two numbers.

```java
package overloading;
import java.util.Scanner;
public class overloading8 {

        public static int min(int a, int b) {
            return (a < b) ? a : b;
        }

        public static float min(float a, float b) {
            return (a < b) ? a : b;
        }

        public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);

            System.out.print("Enter first integer: ");
            int int1 = sc.nextInt();
            System.out.print("Enter second integer: ");
            int int2 = sc.nextInt();
            System.out.println("Minimum of two integers: " + min(int1,

            System.out.print("Enter first float: ");
            float float1 = sc.nextFloat();
            System.out.print("Enter second float: ");
            float float2 = sc.nextFloat();
            System.out.println("Minimum of two floats: " + min(float1,
        }
    }
```

```
<terminated> overloading8 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_
Enter first integer: 4785
Enter second integer: 55566
Minimum of two integers: 4785
Enter first float: 124579.144
Enter second float: 1257896.34456
Minimum of two floats: 124579.14
```

9. Write a program to calculate the power of a number.

```java
package overloading;
import java.util.Scanner;
public class overloading9 {
        public static void main(String[] args) {
            Scanner scanner = new Scanner(System.in);
            System.out.print("Enter the base number: ");
            double base = scanner.nextDouble();
            System.out.print("Enter the exponent (int): ");
            int exponentInt = scanner.nextInt();
            System.out.print("Enter the exponent (double): ");
            double exponentDouble = scanner.nextDouble();

            System.out.println("Result with int exponent: " + power(bas
            System.out.println("Result with double exponent: " + power(
        }

        public static double power(double base, int exponent) {
            return Math.pow(base, exponent);
        }

        public static double power(double base, double exponent) {
            return Math.pow(base, exponent);
        }
    }

```

```
<terminated> overloading9 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_
Enter the base number: 45
Enter the exponent (int): 78
Enter the exponent (double): 5423
Result with int exponent: 8.9243393172489 96E128
Result with double exponent: Infinity
```

10. Write a program to check whether a number is prime or not.

```java
public class overloading10 {

        public static void main(String[] args) {
            Scanner scanner = new Scanner(System.in);
            System.out.print("Enter a number: ");
            int number = scanner.nextInt();

            System.out.println("Is " + number + " prime (int method)? "
            System.out.println("Is " + number + " prime (long method)?
        }

        public static boolean isPrime(int number) {
            if (number <= 1) return false;
            for (int i = 2; i <= Math.sqrt(number); i++) {
                if (number % i == 0) {
                    return false;
                }
            }
            return true;
        }

        public static boolean isPrime(long number) {
            if (number <= 1) return false;
            for (long i = 2; i <= Math.sqrt(number); i++) {
                if (number % i == 0) {
                    return false;
                }
```

```
<terminated> overloading10 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86
Enter a number: 23
Is 23 prime (int method)? true
Is 23 prime (long method)? true
```

11. Write a program to find the square root of a number

```java
package overloading;
import java.util.Scanner;

public class overloading11 {

	public static void main(String[] args) {
		Scanner scanner = new Scanner(System.in);
		System.out.print("Enter a number (int): ");
		int numInt = scanner.nextInt();
		System.out.print("Enter a number (double): ");
		double numDouble = scanner.nextDouble();

		System.out.println("Square root (int method): " + sqrt(numI
		System.out.println("Square root (double method): " + sqrt(n
	}

	public static double sqrt(int num) {
		return Math.sqrt(num);
	}

	public static double sqrt(double num) {
		return Math.sqrt(num);
	}
}
```

```
<terminated> overloading11 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_
Enter a number (int): 4785
Enter a number (double): 145789
Square root (int method): 69.17369442208505
Square root (double method): 381.8232575420204
```

12. Write a program to calculate the perimeter of a rectangle.

```java
package overloading;
import java.util.Scanner;
public class overloading12 {
	public static void main(String[] args) {
		Scanner scanner = new Scanner(System.in);
		System.out.print("Enter the length of the rectangle (int):
		int lengthInt = scanner.nextInt();
		System.out.print("Enter the width of the rectangle (int): "
		int widthInt = scanner.nextInt();
		System.out.print("Enter the length of the rectangle (double
		double lengthDouble = scanner.nextDouble();
		System.out.print("Enter the width of the rectangle (double)
		double widthDouble = scanner.nextDouble();

		System.out.println("Perimeter (int method): " + perimeter(l
		System.out.println("Perimeter (double method): " + perimete
	}

	public static int perimeter(int length, int width) {
		return 2 * (length + width);
	}

	public static double perimeter(double length, double width) {
		return 2 * (length + width);
	}
}
```

```
<terminated> overloading12 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86
Enter the length of the rectangle (int): 74
Enter the width of the rectangle (int): 58
Enter the length of the rectangle (double): 98
Enter the width of the rectangle (double): 17
Perimeter (int method): 264
Perimeter (double method): 230.0
```

13. Write a program to find the area of a circle.

```java
package overloading;
import java.util.Scanner;
public class overloading13 {
        public static void main(String[] args) {
            Scanner scanner = new Scanner(System.in);
            System.out.print("Enter the radius of the circle (int): ");
            int radiusInt = scanner.nextInt();
            System.out.print("Enter the radius of the circle (double): ");
            double radiusDouble = scanner.nextDouble();

            System.out.println("Area (int method): " + area(radiusInt));
            System.out.println("Area (double method): " + area(radiusDo
        }

        public static double area(int radius) {
            return Math.PI * radius * radius;
        }

        public static double area(double radius) {
            return Math.PI * radius * radius;
        }
    }
```

```
<terminated> overloading13 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x8
Enter the radius of the circle (int): 47
Enter the radius of the circle (double): 4579.123
Area (int method): 6939.778171779853
Area (double method): 6.58740691359550O6E7
```

14. Write a program to find the area of a triangle.

```java
        public static void main(String[] args) {
            Scanner scanner = new Scanner(System.in);

            // For base and height
            System.out.print("Enter the base of the triangle (int): ");
            int baseInt = scanner.nextInt();
            System.out.print("Enter the height of the triangle (int): ");
            int heightInt = scanner.nextInt();

            // For base and height as double
            System.out.print("Enter the base of the triangle (double): ");
            double baseDouble = scanner.nextDouble();
            System.out.print("Enter the height of the triangle (double): ");
            double heightDouble = scanner.nextDouble();

            System.out.println("Area using base and height (int): " + a
            System.out.println("Area using base and height (double): "
        }

        // Method to calculate area using base and height (int)
        public static double area(int base, int height) {
            return 0.5 * base * height;
        }

        // Method to calculate area using base and height (double)
        public static double area(double base, double height) {
```

```
<terminated> overloading14 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x8
Enter the base of the triangle (int): 78
Enter the height of the triangle (int): 74
Enter the base of the triangle (double): 74587
Enter the height of the triangle (double): 45874
Area using base and height (int): 2886.0
Area using base and height (double): 1.71080201969
```

15. Write a program to convert temperature from Celsius to Fahrenheit.

```java
package overloading;
import java.util.Scanner;
public class overloading15 {
        public static void main(String[] args) {
            Scanner scanner = new Scanner(System.in);
            System.out.print("Enter temperature in Celsius (int): ");
            int celsiusInt = scanner.nextInt();
            System.out.print("Enter temperature in Celsius (double): ")
            double celsiusDouble = scanner.nextDouble();

            System.out.println("Celsius to Fahrenheit (int method): " +
            System.out.println("Celsius to Fahrenheit (double method):
        }

        public static double celsiusToFahrenheit(int celsius) {
            return (celsius * 9/5.0) + 32;
        }

        public static double celsiusToFahrenheit(double celsius) {
            return (celsius * 9/5.0) + 32;
        }
    }
```

```
Console
<terminated> overloading15 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x8
Enter temperature in Celsius (int): 7845
Enter temperature in Celsius (double): 75458
Celsius to Fahrenheit (int method): 14153.0
Celsius to Fahrenheit (double method): 135856.4
```

16. Write a program to convert temperature from Fahrenheit to Celsius.

```java
package overloading;
import java.util.Scanner;

public class overloading16 {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter temperature in Fahrenheit (int): ");
        int fahrenheitInt = scanner.nextInt();
        System.out.print("Enter temperature in Fahrenheit (double): ");
        double fahrenheitDouble = scanner.nextDouble();

        System.out.println("Fahrenheit to Celsius (int): " + fahrenheit
        System.out.println("Fahrenheit to Celsius (double): " + fahrenh
    }

    public static double fahrenheitToCelsius(int fahrenheit) {
        return (fahrenheit - 32) * 5 / 9.0;
    }

    public static double fahrenheitToCelsius(double fahrenheit) {
        return (fahrenheit - 32) * 5 / 9.0;
    }
}
```

```
Console
<terminated> overloading16 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_
Enter temperature in Fahrenheit (int): 457
Enter temperature in Fahrenheit (double): 12457
Fahrenheit to Celsius (int): 236.11111111111111
Fahrenheit to Celsius (double): 6902.777777777777
```

17. Write a program to find the volume of a sphere.

```java
package overloading;
import java.util.Scanner;
public class overloading17 {
        public static void main(String[] args) {
            Scanner scanner = new Scanner(System.in);
            System.out.print("Enter radius (int): ");
            int radiusInt = scanner.nextInt();
            System.out.print("Enter radius (double): ");
            double radiusDouble = scanner.nextDouble();

            System.out.println("Volume (int method): " + volume(radiusI
            System.out.println("Volume (double method): " + volume(radi
        }

        public static double volume(int radius) {
            return (4 / 3.0) * Math.PI * Math.pow(radius, 3);
        }

        public static double volume(double radius) {
            return (4 / 3.0) * Math.PI * Math.pow(radius, 3);
        }
    }
```

```
<terminated> overloading17 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_
Enter radius (int): 4578
Enter radius (double): 74589
Volume (int method): 4.018981196899893E11
Volume (double method): 1.7382529030588O5E15
```

18. Write a program to find the average of an array of integers.

```java
package overloading;
import java.util.Scanner;
public class overloading18 {

        public static void main(String[] args) {
            Scanner scanner = new Scanner(System.in);
            System.out.print("Enter the number of elements: ");
            int n = scanner.nextInt();
            int[] arr = new int[n];

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

            System.out.println("Average: " + average(arr));
        }

        public static double average(int[] arr) {
            double sum = 0;
            for (int num : arr) {
                sum += num;
            }
            return sum / arr.length;
        }
    }
```

```
<terminated> overloading18 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_
Enter the number of elements: 5
Enter elements:
12
45
78
96
63
Average: 58.8
```

19. Write a program to calculate the compound interest.

```java
package overloading;
import java.util.Scanner;
public class overloading19 {
        public static void main(String[] args) {
            Scanner scanner = new Scanner(System.in);
            System.out.print("Enter principal amount: ");
            double principal = scanner.nextDouble();
            System.out.print("Enter annual interest rate (in %): ");
            double rate = scanner.nextDouble();
            System.out.print("Enter time in years: ");
            int time = scanner.nextInt();
            System.out.print("Enter number of times interest is compoun
            int n = scanner.nextInt();

            System.out.println("Compound Interest: " + compoundInterest
        }

        public static double compoundInterest(double principal, double
            return principal * Math.pow(1 + (rate / (100 * n)), n * tim
        }
    }
```

```
<terminated> overloading19 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x
Enter principal amount: 78945
Enter annual interest rate (in %): 20
Enter time in years: 5
Enter number of times interest is compounded per year: 7
Compound Interest: 132662.27944538492
```

20. Write a program to find the area of a trapezoid.

```java
package overloading;
import java.util.Scanner;
public class overloading20 {
        public static void main(String[] args) {
            Scanner scanner = new Scanner(System.in);
            System.out.print("Enter the first base length (int): ");
            int base1Int = scanner.nextInt();
            System.out.print("Enter the second base length (int): ");
            int base2Int = scanner.nextInt();
            System.out.print("Enter the height (int): ");
            int heightInt = scanner.nextInt();

            System.out.println("Area (int method): " + area(base1Int, b
        }

        public static double area(int base1, int base2, int height) {
            return 0.5 * (base1 + base2) * height;
        }
    }
```

```
<terminated> overloading20 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_
Enter the first base length (int): 74
Enter the second base length (int): 554
Enter the height (int): 45
Area (int method): 14130.0
```

21. Write a program to find the area of a parallelogram.

```java
package overloading;
import java.util.Scanner;
public class overloading21 {

        public static void main(String[] args) {
            Scanner scanner = new Scanner(System.in);
            System.out.print("Enter base (int): ");
            int baseInt = scanner.nextInt();
            System.out.print("Enter height (int): ");
            int heightInt = scanner.nextInt();

            System.out.println("Area (int method): " + area(baseInt, he
        }

        public static double area(int base, int height) {
            return base * height;
        }
    }
```

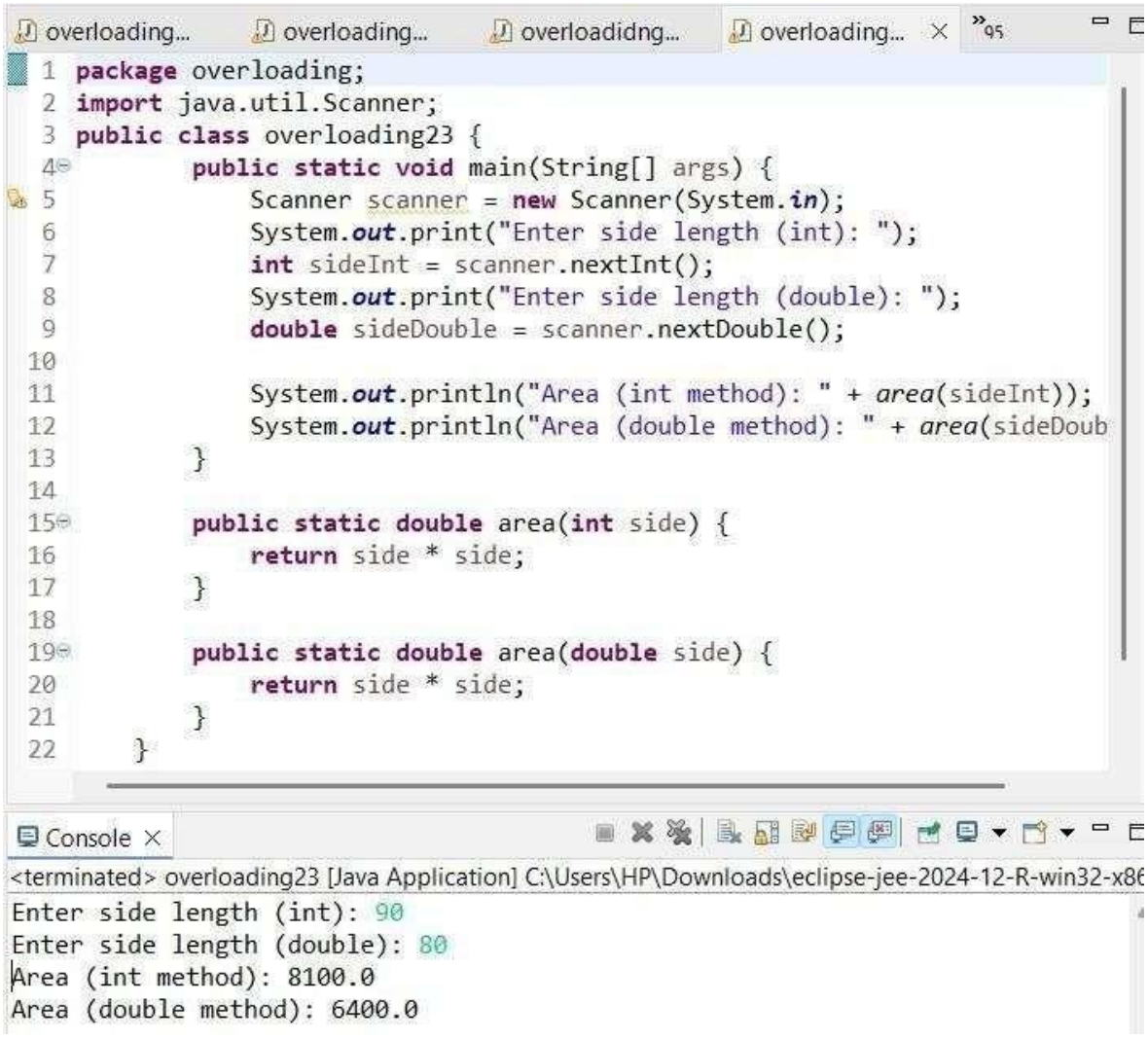
```
<terminated> overloading21 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32
Enter base (int): 45
Enter height (int): 124
Area (int method): 5580.0
```

22. Write a program to calculate the simple interest.

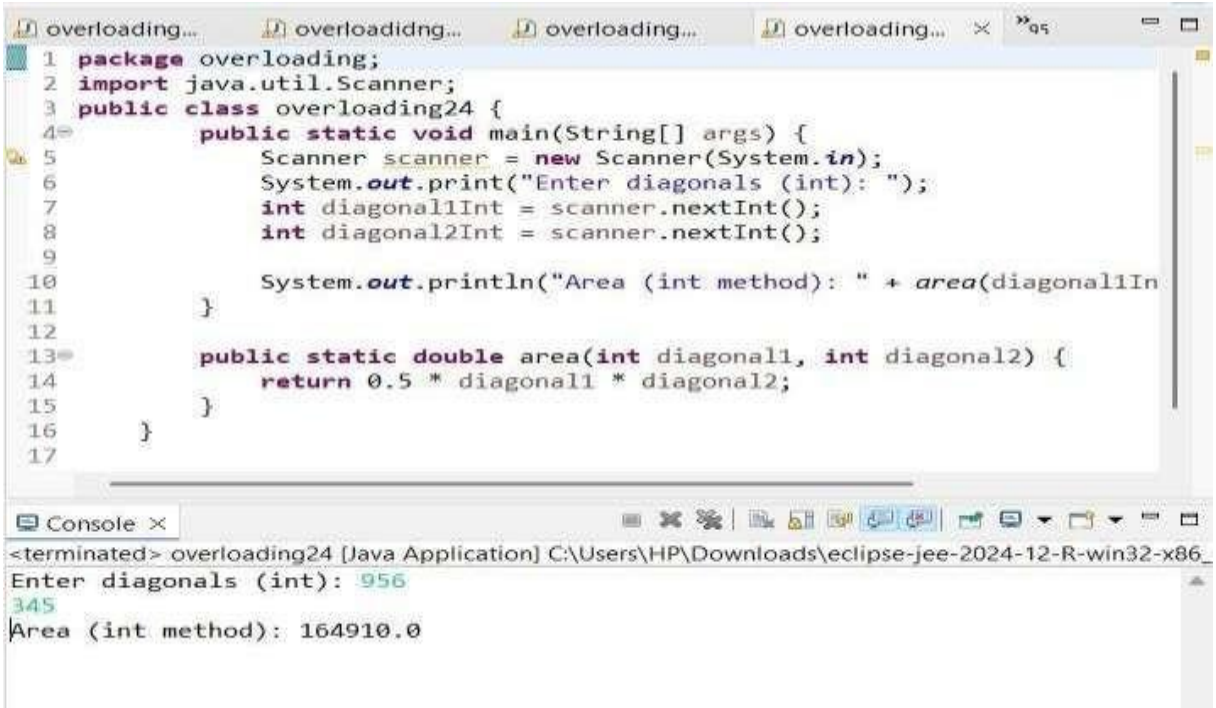
```java
package overloading;
import java.util.Scanner;

public class overloadidng22 {

        public static void main(String[] args) {
            Scanner scanner = new Scanner(System.in);
            System.out.print("Enter principal amount: ");
            double principal = scanner.nextDouble();
            System.out.print("Enter annual interest rate (in %): ");
            double rate = scanner.nextDouble();
            System.out.print("Enter time in years: ");
            int time = scanner.nextInt();

            System.out.println("Simple Interest: " + simpleInterest(pri
        }

        public static double simpleInterest(double principal, double ra
            return (principal * rate * time) / 100;
```

```
<terminated> overloadidng22 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x
Enter principal amount: 4500
Enter annual interest rate (in %): 23
Enter time in years: 4
Simple Interest: 4140.0
```

23. Write a program to find the area of a square.



24. Write a program to find the area of a rhombus.



25. Write a program to find the area of a regular polygon.

```java
package overloading;
import java.util.Scanner;
public class overloading25 {
        public static void main(String[] args) {
            Scanner scanner = new Scanner(System.in);
            System.out.print("Enter the number of sides: ");
            int n = scanner.nextInt();
            System.out.print("Enter the side length (int): ");
            int sideLengthInt = scanner.nextInt();
            System.out.print("Enter the side length (double): ");
            double sideLengthDouble = scanner.nextDouble();

            System.out.println("Area (int method): " + area(n, sideLeng
            System.out.println("Area (double method): " + area(n, sideL
        }

        public static double area(int n, int sideLength) {
            return (n * sideLength * sideLength) / (4 * Math.tan(Math.P
        }

        public static double area(int n, double sideLength) {
            return (n * sideLength * sideLength) / (4 * Math.tan(Math.P
        }
    }
```

```
<terminated> overloading25 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x8
Enter the number of sides: 5
Enter the side length (int): 34
Enter the side length (double): 3456
Area (int method): 1988.8718750808457
Area (double method): 2.0549271962080986E7
```

Static

1 Write a program to count the number of objects created for a class using a static variable

```java
package staticprograms;
    public class static1 {
        static int count = 0;

        public static1() {
            count++;
        }

        public static void main(String[] args) {
            static1 obj1 = new static1();
            static1 obj2 = new static1();
            static1 obj3 = new static1();

            System.out.println("Number of objects created: " + count);
        }
    }
```

```
<terminated> static1 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\eclip
Number of objects created: 3
```

2. Implement a static method to find the factorial of a number

```java
package staticprograms;
    public class static2 {
        public static int static2(int n) {
            if (n == 0 || n == 1) {
                return 1;
            }
            return n * static2(n - 1);
        }

        public static void main(String[] args) {
            int num = 5;
            System.out.println("Factorial of " + num + " is " + static2
        }
    }
```

```
<terminated> static2 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecli
Factorial of 5 is 120
```

3. Write a program to calculate the area of a circle using a static method

```java
package staticprograms;
    public class static3 {
        public static double area(double radius) {
            return Math.PI * radius * radius;
        }

        public static void main(String[] args) {
            double radius = 7;
            System.out.println("Area of the circle: " + area(radius));
        }
    }
```

```
<terminated> static3 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecli
Area of the circle: 153.93804002589985
```

4. Write a program to find the sum of elements in an array using a static method

```java
package staticprograms;
    public class static4  {
        public static int sum(int[] arr) {
            int sum = 0;
            for (int num : arr) {
                sum += num;
            }
            return sum;
        }

        public static void main(String[] args) {
            int[] arr = {1, 2, 3, 4, 5};
            System.out.println("Sum of elements in the array: " + sum(a
        }
    }
```

```
<terminated> static4 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecl
Sum of elements in the array: 15
```

5. Write a program to find the maximum of two numbers using a static method

static1.java × static2.java static3.java static4.java static5.java ×

practiseprograms/src/staticprograms/static1.java

```
3  public class static5 {
4          public static int max(int a, int b) {
5              return (a > b) ? a : b;
6          }
7
8          public static void main(String[] args) {
9              int a = 10, b = 20;
10             System.out.println("Maximum of " + a + " and " + b + " is "
11         }
12     }
13
14
```

Console ×

```
<terminated> static5 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecli
Maximum of 10 and 20 is 20
```

6. Write a program to find the minimum of two numbers using a static method

static2.java static3.java static4.java static5.java static6.java ×

```
1  package staticprograms;
2
3  public class static6 {
4          public static int min(int a, int b) {
5              return (a < b) ? a : b;
6          }
7
8          public static void main(String[] args) {
9              int a = 10, b = 20;
10             System.out.println("Minimum of " + a + " and " + b + " is "
11         }
12     }
13
```

Console ×

```
<terminated> static6 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\
Minimum of 10 and 20 is 10
```

7. Write a program to find the power of a number using a static method

static3.java static4.java static5.java static6.java static7.java ×

```
1  package staticprograms;
2
3  public class static7 {
4          public static double power(double base, int exponent) {
5              return Math.pow(base, exponent);
6          }
7
8          public static void main(String[] args) {
9              double base = 2, exponent = 3;
10             System.out.println(base + " raised to the power " + exponen
11         }
12     }
13
14
```

Console ×

```
<terminated> static7 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\eclip
2.0 raised to the power 3.0 is 8.0
```

8. Write a program to calculate the square root of a number using a static method

static4.java | static5.java | static6.java | static7.java | ststic8.java

```
1  package staticprograms;
2
3  public class ststic8 {
4          public static double sqrt(double number) {
5              return Math.sqrt(number);
6          }
7
8          public static void main(String[] args) {
9              double number = 25;
10             System.out.println("Square root of " + number + " is " + sq
11         }
12     }
13
```

Console

```
<terminated> ststic8 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\e
Square root of 25.0 is 5.0
```

9. Write a program to find the area of a triangle using a static method

static6.java | static7.java | ststic8.java | static9.java | static10.java

```
1  package staticprograms;
2
3  public class static9 {
4          public static double area(double base, double height) {
5              return 0.5 * base * height;
6          }
7
8          public static void main(String[] args) {
9              double base = 5, height = 10;
10             System.out.println("Area of the triangle: " + area(base, he
11         }
12     }
13
14
```

Console

```
<terminated> static9 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecl
Area of the triangle: 25.0
```

10. Write a program to calculate the simple interest using a static method

static6.java | static7.java | ststic8.java | static9.java | static10.java

```
1  package staticprograms;
2
3  public class static10 {
4          public static double calculateSimpleInterest(double principal,
5              return (principal * rate * time) / 100;
6          }
7
8          public static void main(String[] args) {
9              double principal = 1000, rate = 5, time = 2;
10             System.out.println("Simple Interest: " + calculateSimpleInt
11         }
12     }
13
```

Console

```
<terminated> static10 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ec
Simple Interest: 100.0
```

11. Write a program to find the volume of a cylinder using a static method

```java
package staticprograms;

public class static11 {
        public static double volume(double radius, double height) {
            return Math.PI * Math.pow(radius, 2) * height;
        }

        public static void main(String[] args) {
            double radius = 7, height = 10;
            System.out.println("Volume of the cylinder: " + volume(radi
        }
    }
```

```
<terminated> static11 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecl
Volume of the cylinder: 1539.3804002589986
```

12. Write a program to calculate the compound interest using a static method

```java
package staticprograms;

public class static12 {
        public static double calculateCompoundInterest(double principal
            return principal * Math.pow(1 + (rate / n), n * time) - pri
        }

        public static void main(String[] args) {
            double principal = 1000, rate = 5, time = 2;
            int n = 4;  // Quarterly compounding
            System.out.println("Compound Interest: " + calculateCompoun
        }
    }
```

```
<terminated> static12 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64
Compound Interest: 655840.8355712891
```

13 Write a program to find the area of a rectangle using a static method

```java
package staticprograms;

public class static13 {
        public static double area(double length, double width) {
            return length * width;
        }

        public static void main(String[] args) {
            double length = 5, width = 8;
            System.out.println("Area of the rectangle: " + area(length,
        }
    }
```

```
<terminated> static13 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ec
Area of the rectangle: 40.0
```

14. Write a program to find the area of a square using a static method

```java
package staticprograms;

public class static14 {
        public static double area(double side) {
            return side * side;
        }

        public static void main(String[] args) {
            double side = 4;
            System.out.println("Area of the square: " + area(side));
        }
    }
```

```
<terminated> static14 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecli
Area of the square: 16.0
```

15. Write a program to find the area of a rhombus using a static method

```java
package staticprograms;

public class static15 {
        public static double area(double diagonal1, double diagonal2) {
            return 0.5 * diagonal1 * diagonal2;
        }

        public static void main(String[] args) {
            double diagonal1 = 6, diagonal2 = 8;
            System.out.println("Area of the rhombus: " + area(diagonal1
        }
    }
```

```
<terminated> static15 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecl
Area of the rhombus: 24.0
```

16. Write a program to find the area of a parallelogram using a static method

```java
package staticprograms;

public class static16 {
        public static double area(double base, double height) {
            return base * height;
        }

        public static void main(String[] args) {
            double base = 5, height = 7;
            System.out.printl
        }
    }
```

```
double height - staticprograms.static16.main (
    String[]
)
```

```
<terminated> static16 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecl
Area of the parallelogram: 35.0
```

17. Write a program to find the area of a trapezoid using a static method.

```
static14.java  static15.java  static16.java  static17.java ×
 1 package staticprograms;
 2
 3 public class static17 {
 4         public static double area(double base1, double base2, double he
 5             return 0.5 * (base1 + base2) * height;
 6         }
 7
 8         public static void main(String[] args) {
 9             double base1 = 5, base2 = 7, height = 4;
10             System.out.println("Area of the trapezoid: " + area(base1,
11         }
12     }
13
14
15
Console ×
<terminated> static17 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecli
Area of the trapezoid: 24.0
```

18. Write a program to find the area of a regular polygon using a static method.

```
static15.java  static16.java  static17.java  static18.java ×
 1 package staticprograms;
 2
 3 public class static18 {
 4     public static double area(int sides, double length) {
 5         return (sides * length * length) / (4 * Math.tan(Math.PI /
 6     }
 7
 8     public static void main(String[] args) {
 9         int sides = 6;
10         double length = 5;
11         System.out.println("Area of the polygon: " + area(sides, le
12     }
13 }
14
Console ×
<terminated> static18 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecli
Area of the polygon: 64.9519052838329
```

19. Write a program to convert temperature from Celsius to Fahrenheit using a static method

```
static16.java  static17.java  static18.java  static19.java ×
 1 package staticprograms;
 2
 3 public class static19 {
 4         public static double celsiusToFahrenheit(double celsius) {
 5             return (celsius * 9/5) + 32;
 6         }
 7
 8         public static void main(String[] args) {
 9             double celsius = 25;
10             System.out.println(celsius + " Celsius is " + celsiusToFahr
11         }
12     }
13
14
Console ×
<terminated> static19 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecl
25.0 Celsius is 77.0 Fahrenheit
```

20. Write a program to Fahrenheit to Celsius using static S convert temperature from Fahrenheit to Celsius using a static

```java
package staticprograms;

public class static20 {
	public static double fahrenheitToCelsius(double fahrenheit) {
		return (fahrenheit - 32) * 5/9;
	}

	public static void main(String[] args) {
		double fahrenheit = 77;
		System.out.println(fahrenheit + " Fahrenheit is " + fahrenh
	}
}
```

```
<terminated> static20 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecl
77.0 Fahrenheit is 25.0 Celsius
```

21. Write a program to find the factorial of a number using recursion and a static method.

```java
package staticprograms;

public class static21 {
	public static int factorial(int n) {
		if (n == 0) return 1;
		return n * factorial(n - 1);
	}

	public static void main(String[] args) {
		int num = 5;
		System.out.println("Factorial of " + num + " is " + factori
	}
}
```

```
<terminated> static21 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecli
Factorial of 5 is 120
```

22 Write a program to find the sum of digits of a number using recursion and a static method.

```java
package staticprograms;

public class static22 {
	public static int sumOfDigits(int n) {
		if (n == 0) return 0;
		return n % 10 + sumOfDigits(n / 10);
	}

	public static void main(String[] args) {
		int num = 123;
		System.out.println("Sum of digits of " + num + " is " + sum
	}
}
```

```
<terminated> static22 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64
Sum of digits of 123 is 6
```

23. Write a program to find the power of a number using recursion and a static method

```java
package staticprograms;

public class static23 {
    public static int power(int base, int exponent) {
        if (exponent == 0) return 1;
        return base * power(base, exponent - 1);
    }

    public static void main(String[] args) {
        int base = 2, exponent = 3;
        System.out.println(base + " raised to the power " + exponent +
    }
}
```

```
<terminated> static23 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\e
2 raised to the power 3 is 8
```

24. Write a program to find the Fibonacci series using recursion and a static method

```java
package staticprograms;

public class static24 {
    public static int fibonacci(int n) {
        if (n <= 1) return n;
        return fibonacci(n - 1) + fibonacci(n - 2);
    }

    public static void main(String[] args) {
        int num = 6;
        System.out.println("Fibonacci of " + num + " is " + fibonacci(n
    }
}
```

```
<terminated> static24 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\e
Fibonacci of 6 is 8
```

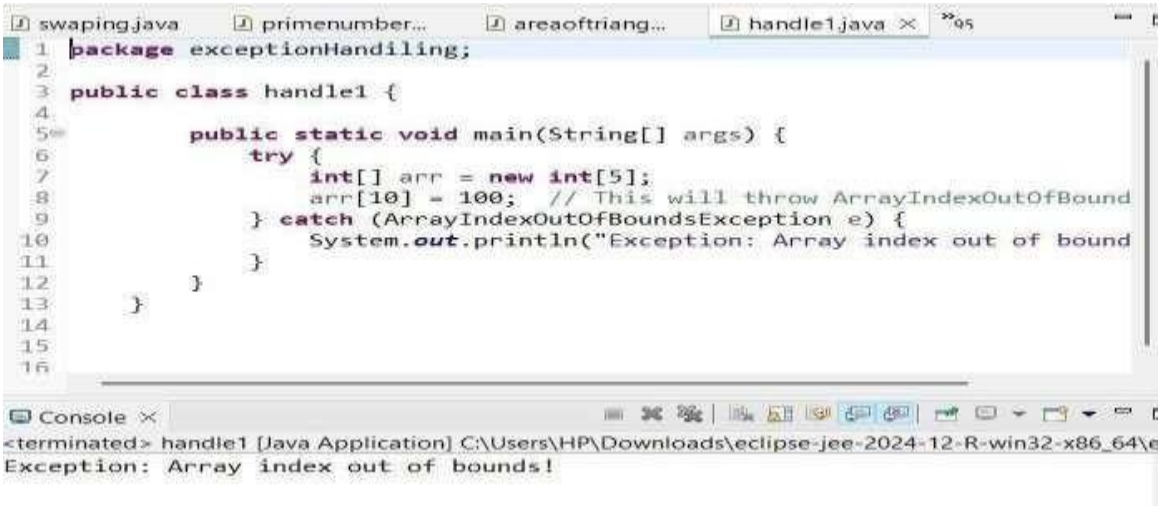
25. Write a program to reverse a string using recursion and a static method

```java
package staticprograms;

public class static25 {
    public static String reverse(String str) {
        if (str.isEmpty()) return str;
        return reverse(str.substring(1)) + str.charAt(0);
    }

    public static void main(String[] args) {
        String str = "hello";
        System.out.println("Reversed string: " + reverse(str));
    }
}
```

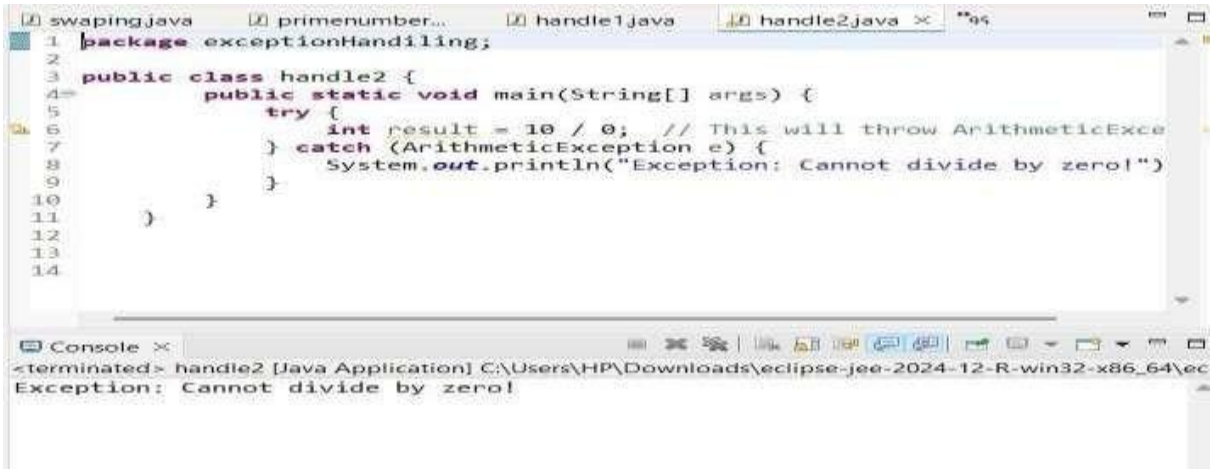
```
<terminated> static25 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ec
Reversed string: olleh
```

Exception Handling:

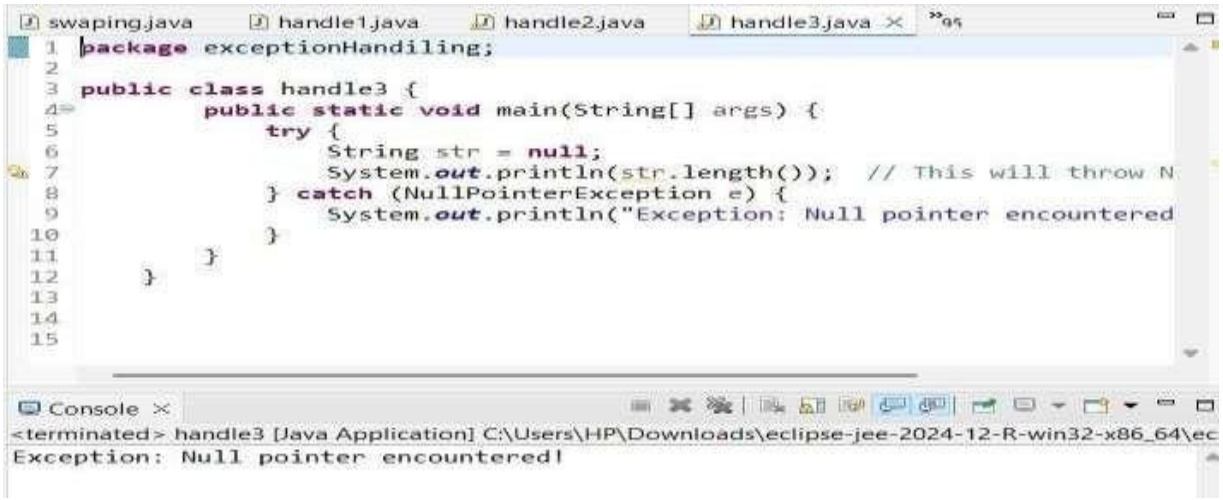
1. Write a program to handle Array Index Out Of Bounds Exception.



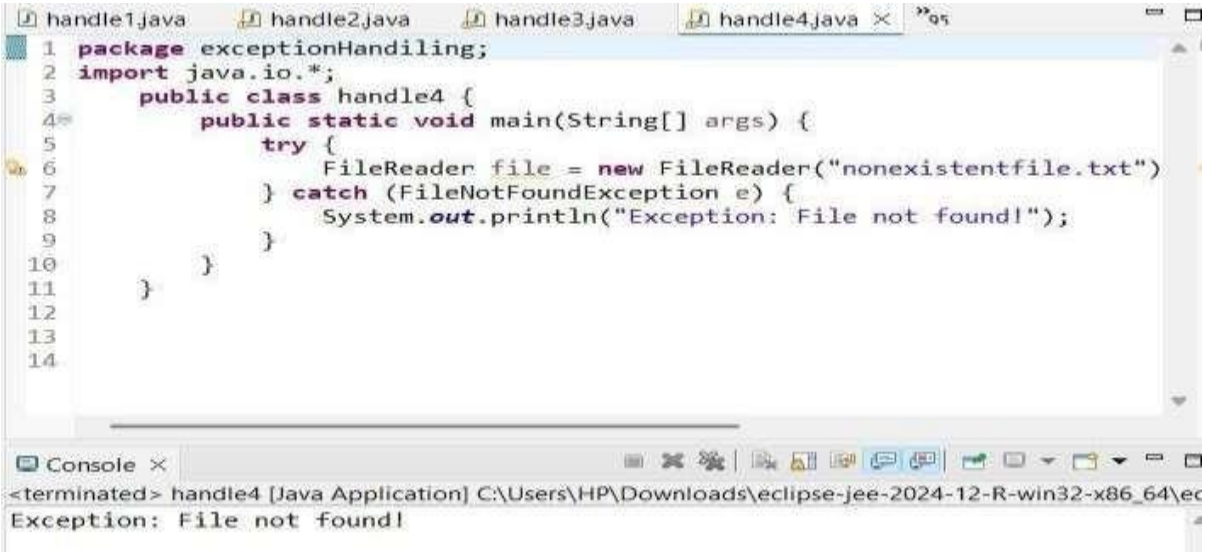
2. Implement a program to handle Arithmetic Exception (division by zero).



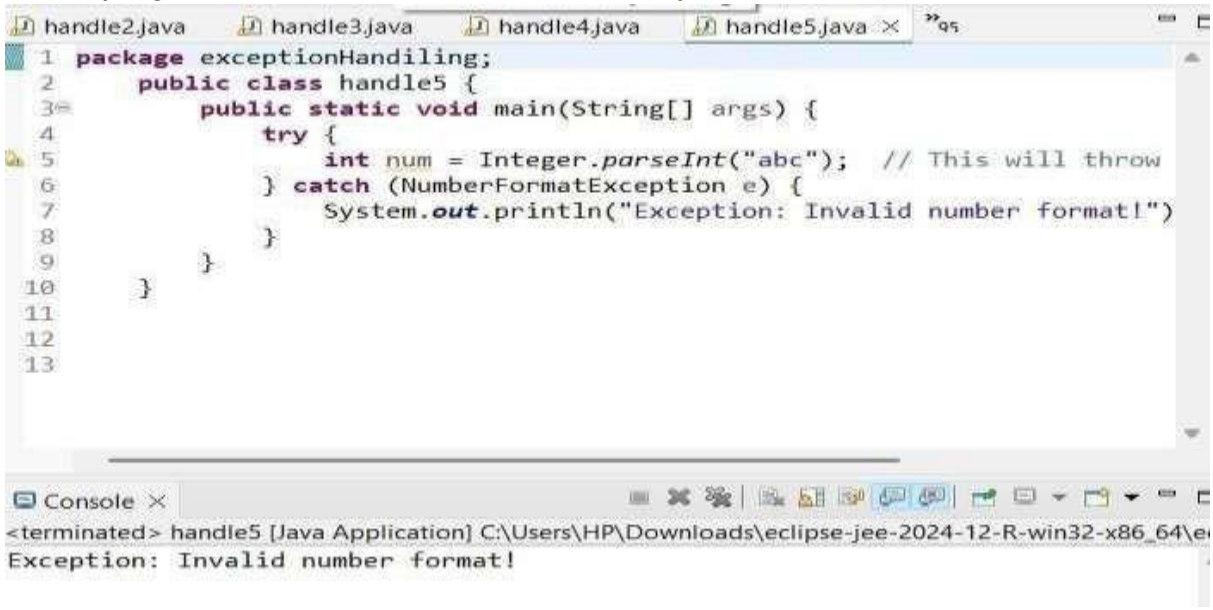
3. Write a program to handle Null Pointer Exception.



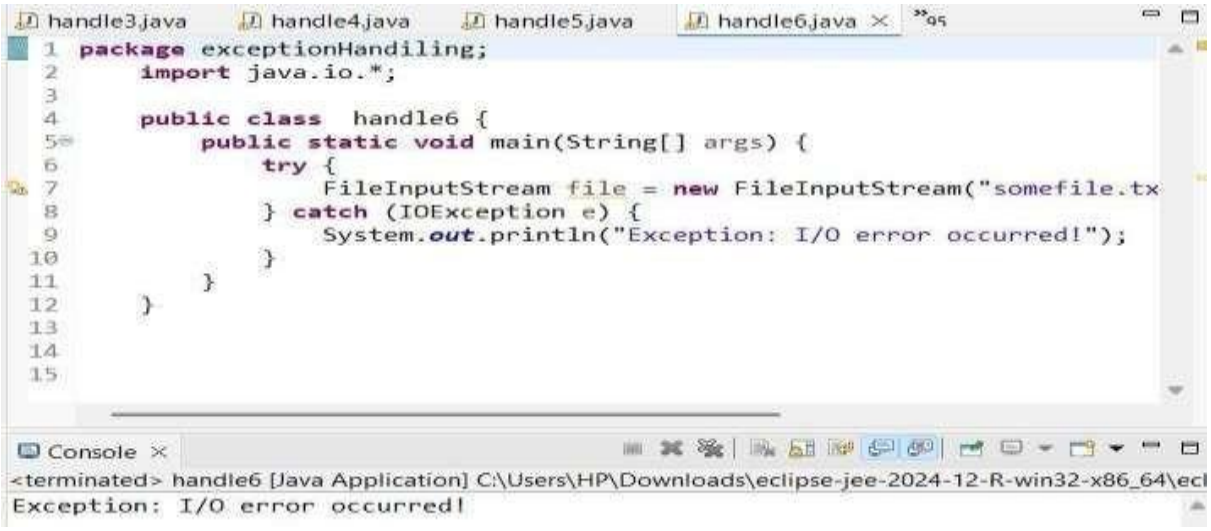
4. Implement a program to handle File Not Found Exception



5. Write a program to handle Number Format Exception.



6. Implement a program to handle IO Exception.



7. Write a program to handle Class Not Found Exception.

```java
package exceptionHandiling;
    public class  handle7 {
        public static void main(String[] args) {
            try {
                Class.forName("NonExistentClass");  // This will throw
            } catch (ClassNotFoundException e) {
                System.out.println("Exception: Class not found!");
            }
        }
    }
```

```
<terminated> handle7 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\e
Exception: Class not found!
```

8. Implement a program to handle Stack Over flow Error.

```java
package exceptionHandiling;
    public class handle8 {
        public static void recursiveMethod() {
            recursiveMethod();  // This will throw StackOverflowError
        }

        public static void main(String[] args) {
            try {
                recursiveMethod();
            } catch (StackOverflowError e) {
                System.out.println("Error: Stack Overflow!");
            }
        }
    }
```

```
<terminated> handle8 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ec
Error: Stack Overflow!
```

9. Write a program to handle Negative Array Size Exception

```java
package exceptionHandiling;
    public class handle9 {
        public static void main(String[] args) {
            try {
                int[] arr = new int[-5];  // This will throw NegativeAr
            } catch (NegativeArraySizeException e) {
                System.out.println("Exception: Negative array size!");
            }
        }
    }
```

```
<terminated> handle9 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ec
Exception: Negative array size!
```

10. Implement a program to handle Interrupted Exception.

handle7.java handle8.java handle9.java handle10.java

```
1  package exceptionHandiling;
2
3  public class handle10 {
4
5          public static void main(String[] args) throws InterruptedExcept
6              try {
7                  Thread.sleep(5000);  // Thread will sleep for 5 seconds
8                  Thread.currentThread().interrupt();  // Interrupt the t
9                  Thread.sleep(5000);  // This will throw InterruptedExce
10             } catch (InterruptedException e) {
11                 System.out.println("Exception: Thread was interrupted!"
12             }
13         }
14     }
15
16
```

Console

```
<terminated> handle10 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\
Exception: Thread was interrupted!
```

11. Write a program to handle Array Store Exception.

handle7.java handle8.java handle9.java handle10.java

```
1  package exceptionHandiling;
2
3  public class handle10 {
4
5          public static void main(String[] args) throws InterruptedExcept
6              try {
7                  Thread.sleep(5000);  // Thread will sleep for 5 seconds
8                  Thread.currentThread().interrupt();  // Interrupt the t
9                  Thread.sleep(5000);  // This will throw InterruptedExce
10             } catch (InterruptedException e) {
11                 System.out.println("Exception: Thread was interrupted!"
12             }
13         }
14     }
15
16
```

Console

```
<terminated> handle11 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_6
Exception: Array store exception!
```

12. Implement a program to handle Illegal State Exception.

handle8.java handle9.java handle10.java handle12.java

```
1  package exceptionHandiling;
2
3  public class handle12 {
4          public static void main(String[] args) {
5              try {
6                  throw new IllegalStateException("Illegal state encounte
7              } catch (IllegalStateException e) {
8                  System.out.println("Exception: " + e.getMessage());
9              }
10         }
11     }
12
13
14
```

Console

```
<terminated> handle12 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\e
Exception: Illegal state encountered!
```

13. Write a program to handle No Such Element Exception.

```java
package exceptionHandiling;
    import java.util.*;

    public class handle13 {
        public static void main(String[] args) {
            try {
                List<String> list = new ArrayList<>();
                list.add("Element 1");
                Iterator<String> iterator = list.iterator();
                iterator.next();  // This will return the first element
                iterator.next();  // This will throw NoSuchElementExcep
            } catch (NoSuchElementException e) {
                System.out.println("Exception: No such element found!")
            }
        }
    }
```

```
<terminated> handle13 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\e
Exception: No such element found!
```

14. Implement a program to handle Unsupported Operation Exception.

```java
package exceptionHandiling;
    import java.util.*;

    public class handle14 {
        public static void main(String[] args) {
            try {
                List<String> list = Collections.unmodifiableList(new Ar
                list.add("New Element");  // This will throw Unsupporte
            } catch (UnsupportedOperationException e) {
                System.out.println("Exception: Unsupported operation!")
            }
        }
    }

//15 also same
```

```
<terminated> handle14 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ec
Exception: Unsupported operation!
```

15. Write a program to handle Unsupported Operation Exception.

```java
package exceptionHandiling;
    import java.util.*;

    public class handle14 {
        public static void main(String[] args) {
            try {
                List<String> list = Collections.unmodifiableList(new Ar
                list.add("New Element");  // This will throw Unsupporte
            } catch (UnsupportedOperationException e) {
                System.out.println("Exception: Unsupported operation!")
            }
        }
    }

//15 also same
```

```
<terminated> handle14 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ec
Exception: Unsupported operation!
```

16. Implement a program to handle Concurrent Modification Exception.

```java
public class handle16 {
    public static void main(String[] args) {
        try {
            List<String> list = new ArrayList<>();
            list.add("Element 1");
            list.add("Element 2");

            for (String element : list) {
                list.remove(element);  // This will throw Concurre
            }
        } catch (ConcurrentModificationException e) {
            System.out.println("Exception: Concurrent modification
        }
    }
}
```

```
<terminated> handle16 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_
```

17. Write a program to handle Illegal Argument Exception.

```java
package exceptionHandiling;

public class handle17 {
    public static void main(String[] args) {
        try {
            throw new IllegalArgumentException("Illegal argument pa
        } catch (IllegalArgumentException e) {
            System.out.println("Exception: " + e.getMessage());
        }
    }
}
```

```
<terminated> handle17 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\
Exception: Illegal argument passed!
```

18. Implement a program to handle Security Exception.

```java
package exceptionHandiling;
public class handle18 {
    public static void main(String[] args) {
        try {
            System.setSecurityManager(new SecurityManager());
            throw new SecurityException("Security exception occurre
        } catch (SecurityException e) {
            System.out.println("Exception: Security violation detec
        }
    }
}
```

```
<terminated> handle18 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\e
Exception in thread "main" java.lang.UnsupportedOperationException: The Secur
        at java.base/java.lang.System.setSecurityManager(System.java:430)
        at exceptionHandiling.handle18.main(handle18.java:5)
```

19. Write a program to handle Date Time Parse Exception.

handle16.java handle17.java handle18.java handle19.java

```
1  package exceptionHandiling;
2      import java.time.*;
4
5      public class handle19{
6          public static void main(String[] args) {
7              try {
8                  String invalidDate = "2025-02-31";  // Invalid date
9                  LocalDate.parse(invalidDate);  // This will throw DateT
10             } catch (DateTimeParseException e) {
11                 System.out.println("Exception: Invalid date format!");
12             }
13         }
14     }
15
16
17
```

Console

```
<terminated> handle19 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\e
Exception: Invalid date format!
```

20. Implementa program tohandle Pattern Syntax Exception.

handle17.java handle18.java handle19.java handle20.java

```
1  package exceptionHandiling;
2      import java.util.regex.*;
3
4      public class handle20 {
5          public static void main(String[] args) {
6              try {
7                  Pattern.compile("[");  // This will throw PatternSyntax
8              } catch (PatternSyntaxException e) {
9                  System.out.println("Exception: Invalid regular expressi
10             }
11         }
12     }
13
14
15
```

Console

```
<terminated> handle20 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ec
Exception: Invalid regular expression!
```

21. Write a program to handle Missing Resource Exception.

handle18.java handle19.java handle20.java handle21.java

```
1  package exceptionHandiling;
2      import java.util.*;
3
4      public class handle21 {
5          public static void main(String[] args) {
6              try {
7                  ResourceBundle rb = ResourceBundle.getBundle("nonexiste
8              } catch (MissingResourceException e) {
9                  System.out.println("Exception: Resource bundle not foun
10             }
11         }
12     }
13
14
15
```

Console

```
<terminated> handle21 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ec
Exception: Resource bundle not found!
```

22. Implement a program to handle Formatter Closed Exception.

```java
package exceptionHandiling;
    import java.util.*;

    public class handle22{
        public static void main(String[] args) {
            try (Formatter formatter = new Formatter()) {
                formatter.format("Formatted String: %d", 100);
                formatter.close();
                formatter.format("This will throw exception");  // This
            } catch (FormatterClosedException e) {
                System.out.println("Exception: Formatter is closed!");
            }
        }
    }
```

```
<terminated> handle22 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ec
Exception: Formatter is closed!
```

23. Write a program to handle Buffer Over flow Exception.

```java
package exceptionHandiling;
    import java.nio.*;

    public class handle23 {
        public static void main(String[] args) {
            try {
                ByteBuffer buffer = ByteBuffer.allocate(2);
                buffer.put((byte) 1);
                buffer.put((byte) 2);
                buffer.put((byte) 3);  // This will throw BufferOverflo
            } catch (BufferOverflowException e) {
                System.out.println("Exception: Buffer overflow occurred
            }
        }
    }
```

```
<terminated> handle23 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\
Exception: Buffer overflow occurred!
```

24. Implement a program to handle Buffer Underflow Exception.

```java
package exceptionHandiling;
    import java.nio.*;

    public class handle24 {
        public static void main(String[] args) {
            try {
                ByteBuffer buffer = ByteBuffer.allocate(2);
                buffer.put((byte) 1);
                buffer.flip();
                buffer.get();  // This will work
                buffer.get();  // This will throw BufferUnderflowExcept
            } catch (BufferUnderflowException e) {
                System.out.println("Exception: Buffer underflow occurre
            }
        }
    }
```

```
<terminated> handle24 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ec
Exception: Buffer underflow occurred!
```

1. Write a program to demonstrate Array List by adding, removing, and iterating over elements.

```java
package collectionprogram;
import java.util.ArrayList;

public class collection1 {
    public static void main(String[] args) {
        ArrayList<String> list = new ArrayList<>();

        // Adding elements
        list.add("Apple");
        list.add("Banana");
        list.add("Cherry");

        // Removing element
        list.remove("Banana");

        // Iterating over elements
        for (String item : list) {
            System.out.println(item);
        }
    }
}
```

```
Console
<terminated> collection1 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64
Apple
Cherry
```

1. Implementa program todemonstrate LinkedList by adding, removing, and iterating over elements.

```java
    public static void main(String[] args) {
        LinkedList<String> list = new LinkedL

        // Adding elements
        list.add("Apple");
        list.add("Banana");
        list.add("Cherry");

        // Removing element
        list.remove("Banana");

        // Iterating over elements
        for (String item : list) {
            System.out.println(item);
        }
    }
}
```

```
Console
<terminated> collection2 [Java Application] C:\Users\HP\Downloads\ec
Apple
Cherry
```

2.

3. Write a program to demonstrate HashSet by adding, removing, and iterating over elements.

handle24.java | collection1... | collection2... | collection3...

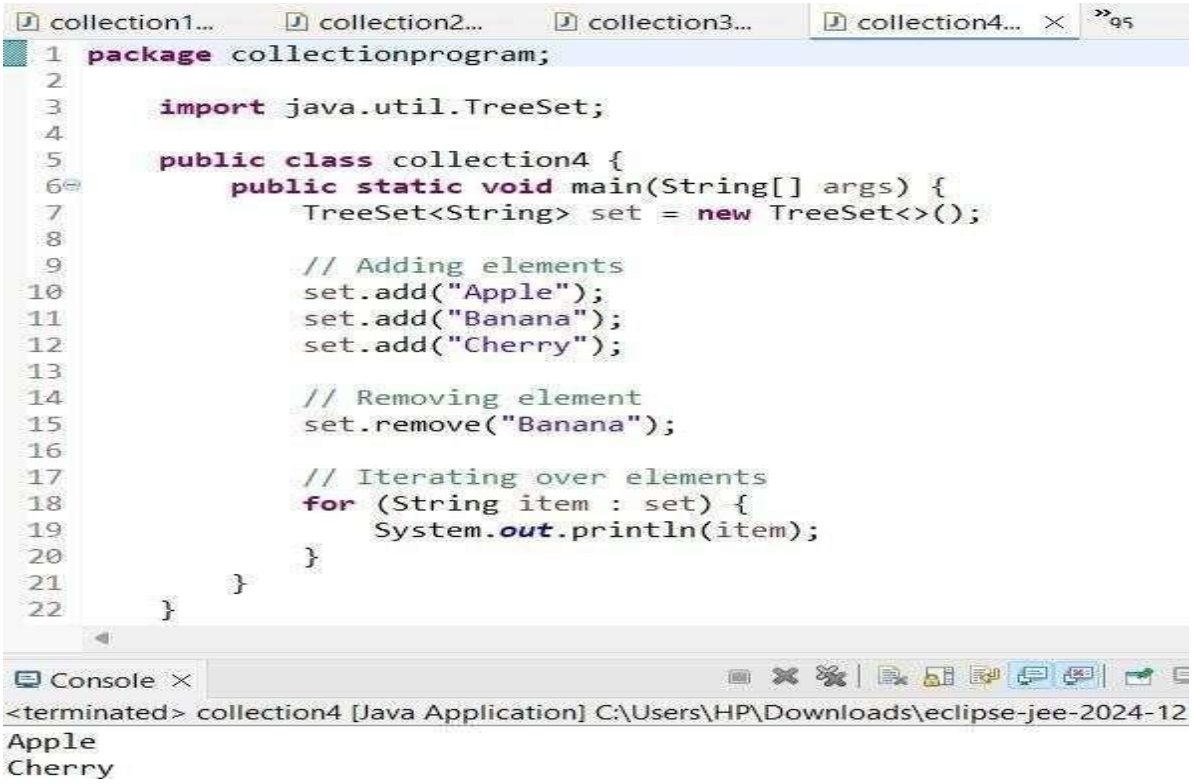
```java
package collectionprogram;
    import java.util.HashSet;

    public class collection3 {
        public static void main(String[] args) {
            HashSet<String> set = new HashSet<>();

            // Adding elements
            set.add("Apple");
            set.add("Banana");
            set.add("Cherry");

            // Removing element
            set.remove("Banana");

            // Iterating over elements
            for (String item : set) {
                System.out.println(item);
            }
        }
    }

```

Console

<terminated> collection3 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64

```
Apple
Cherry
```

4. Implement a program to demonstrate TreeSet by adding, removing, and iterating over elements.



5. Write a program to demonstrate HashMap by adding and retrieving key-value pairs.

Implement a program to demonstrate

```java
package collectionprogram;
    import java.util.HashMap;

    public class colletion5 {
        public static void main(String[] args) {
            HashMap<Integer, String> map = new HashMap<>();

            // Adding key-value pairs
            map.put(1, "Apple");
            map.put(2, "Banana");
            map.put(3, "Cherry");

            // Retrieving value by key
            System.out.println("Key 2: " + map.get(2));
        }
    }
```

```
<terminated> colletion5 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\e
Key 2: Banana
```

6. TreeMap by adding and retrieving key- value pairs.

```java
package collectionprogram;
    import java.util.TreeMap;

    public class collection6 {
        public static void main(String[] args) {
            TreeMap<Integer, String> map = new TreeMap<>();

            // Adding key-value pairs
            map.put(1, "Apple");
            map.put(2, "Banana");
            map.put(3, "Cherry");

            // Retrieving value by key
            System.out.println("Key 2: " + map.get(2));
        }
    }
```

```
<terminated> collection6 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\
Key 2: Banana
```

7. Write a program to demonstrate LinkedHashMap by adding and retrieving key- value pairs.

Implement a program to demonstrate

```java
package collectionprogram;
    import java.util.LinkedHashMap;

    public class collection7 {
        public static void main(String[] args) {
            LinkedHashMap<Integer, String> map = new LinkedHashMap<>();

            // Adding key-value pairs
            map.put(1, "Apple");
            map.put(2, "Banana");
            map.put(3, "Cherry");

            // Retrieving value by key
            System.out.println("Key 2: " + map.get(2));
        }
    }
```

```
<terminated> collection7 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\
Key 2: Banana
```

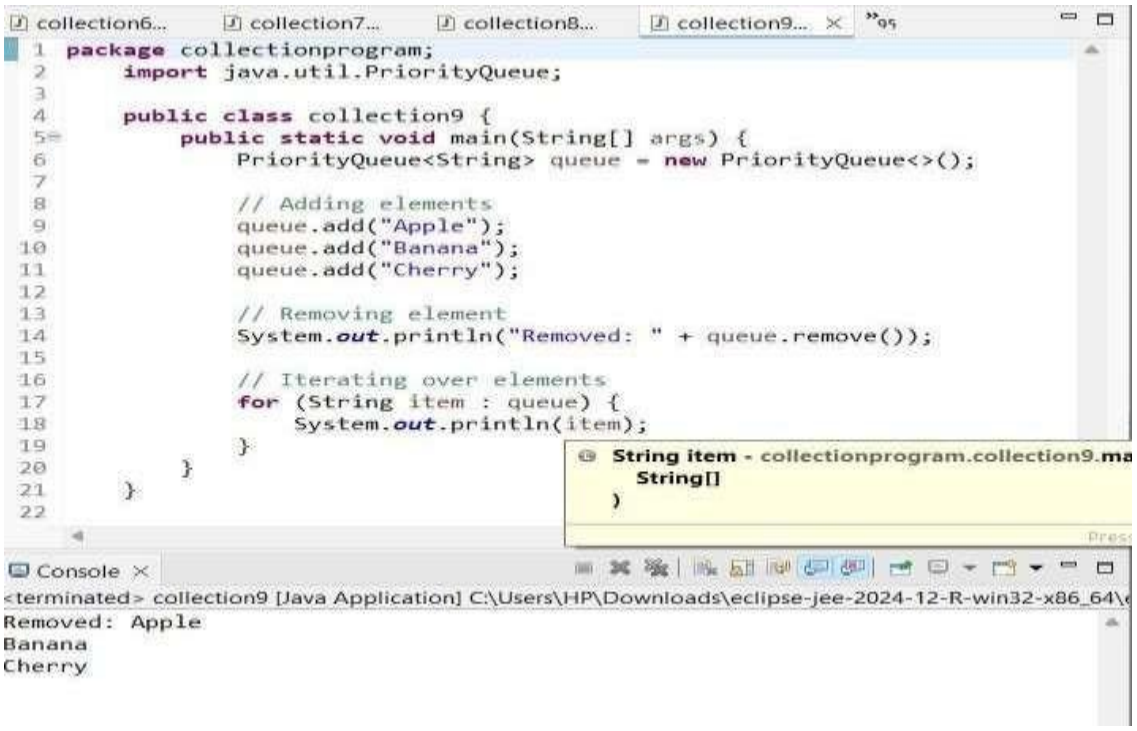
8. Queue by adding, removing, and iterating over elements.

```java
package collectionprogram;
    import java.util.LinkedList;

    public class collection8 {
        public static void main(String[] args) {
            Queue<String> queue = new LinkedList<>();

            // Adding elements
            queue.add("Apple");
            queue.add("Banana");
            queue.add("Cherry");

            // Removing element
            System.out.println("Removed: " + queue.remove());

            // Iterating over elements
            for (String item : queue) {
                System.out.println(item);
            }
        }
    }
```

```
<terminated> collection8 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\
Removed: Apple
Banana
Cherry
```

Implement a program to demonstrate

9. Write a program to demonstrate PriorityQueue by adding, removing, and iterating over elements.



Implement a programto demonstrate

10. Stack by adding, removing, and iterating over elements.

```java
package collectionprogram;
    import java.util.Stack;

    public class collection10 {
        public static void main(String[] args) {
            Stack<String> stack = new Stack<>();

            // Pushing elements onto the stack
            stack.push("Apple");
            stack.push("Banana");
            stack.push("Cherry");

            // Popping an element from the stack
            System.out.println("Popped: " + stack.pop());

            // Iterating over elements
            for (String item : stack) {
                System.out.println(item);
            }
        }
    }
```

```
<terminated> collection10 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64
Popped: Cherry
Apple
Banana
```

11. Write a program to demonstrate ArrayDeque by adding, removing, and iterating overelements

```java
package collectionprogram;
    import java.util.ArrayDeque;

    public class collection11 {
        public static void main(String[] args) {
            ArrayDeque<String> deque = new ArrayDeque<>();

            // Adding elements
            deque.add("Apple");
            deque.add("Banana");
            deque.add("Cherry");

            // Removing elements
            System.out.println("Removed: " + deque.remove());

            // Iterating over elements
            for (String item : deque) {
                System.out.println(item);
            }
        }
    }
```

```
<terminated> collection11 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64
Removed: Apple
Banana
Cherry
```

Implement a programto demonstrate

12. EnumSetby adding, removing, and iterating over elements

```java
package collectionprogram;
    import java.util.EnumSet;

    enum Fruits { APPLE, BANANA, CHERRY }

    public class collection12 {
        public static void main(String[] args) {
            EnumSet<Fruits> set = EnumSet.of(Fruits.APPLE, Fruits.BANAN

            // Adding element
            set.add(Fruits.CHERRY);

            // Removing element
            set.remove(Fruits.BANANA);

            // Iterating over elements
            for (Fruits fruit : set) {
                System.out.println(fruit);
            }
        }
    }
```

```
Console
<terminated> collection12 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64
APPLE
CHERRY
```

13. Write a program to demonstrate BitSet by adding, removing, and iterating over elements.

```java
package collectionprogram;
    import java.util.BitSet;

    public class collection13 {
        public static void main(String[] args) {
            BitSet bitSet = new BitSet();

            // Setting bits
            bitSet.set(0);
            bitSet.set(2);

            // Clearing bit
            bitSet.clear(2);

            // Iterating over bits
            for (int i = 0; i < bitSet.length(); i++) {
                if (bitSet.get(i)) {
                    System.out.println("Bit " + i + " is set.");
                }
            }
        }
    }
```

```
Console
<terminated> collection13 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_
Bit 0 is set.
```

14. Hashtableby adding and retrieving key-value pairs

Implement a programto demonstrate

```java
package collectionprogram;
    import java.util.Hashtable;

    public class collection14 {
        public static void main(String[] args) {
            Hashtable<Integer, String> table = new Hashtable<>();

            // Adding key-value pairs
            table.put(1, "Apple");
            table.put(2, "Banana");
            table.put(3, "Cherry");

            // Retrieving value by key
            System.out.println("Key 2: " + table.get(2));
        }
    }
```

```
Console
<terminated> collection14 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64
Key 2: Banana
```

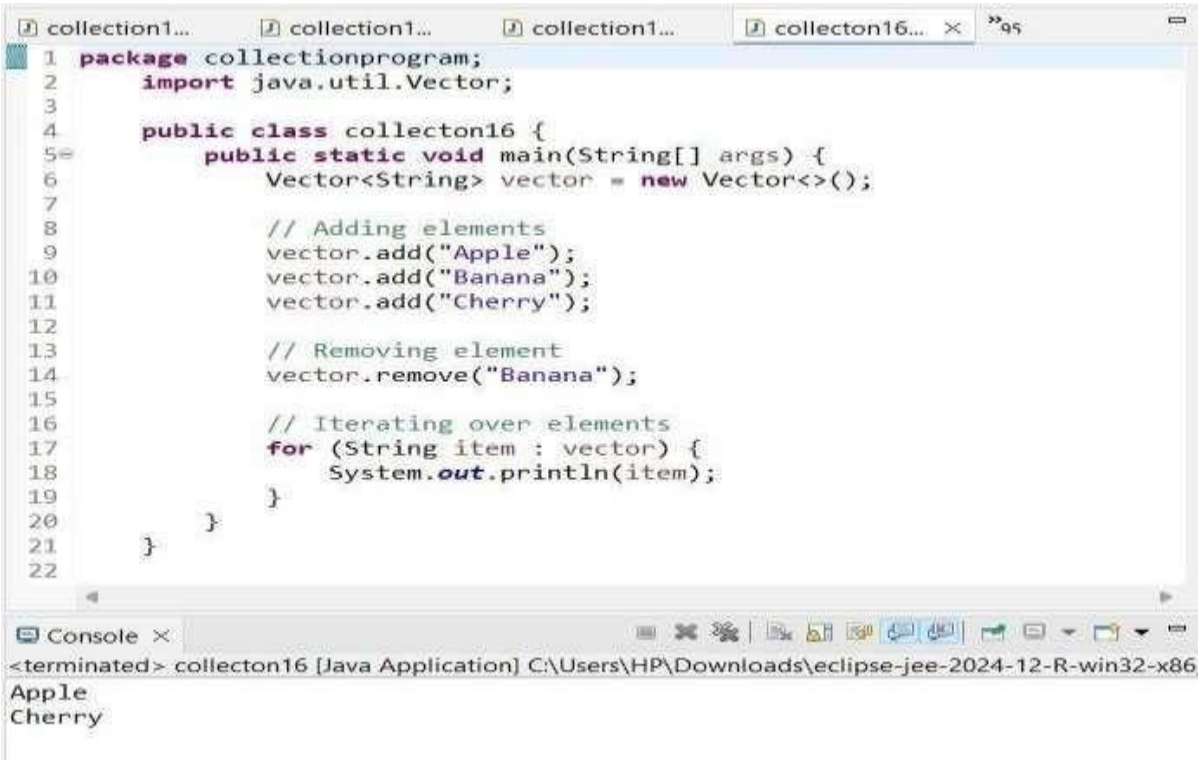
15. Write a program to demonstrate Properties by adding and retrieving key-value pairs.

```java
package collectionprogram;
    import java.util.Properties;

    public class collection15  {
        public static void main(String[] args) {
            Properties properties = new Properties();

            // Adding key-value pairs
            properties.setProperty("username", "admin");
            properties.setProperty("password", "password123");

            // Retrieving value by key
            System.out.println("Username: " + properties.getProperty("u
        }
    }
```

```
Console
<terminated> collection15 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64
Username: admin
```

16. Vector byadding, removing, and iterating over elements.

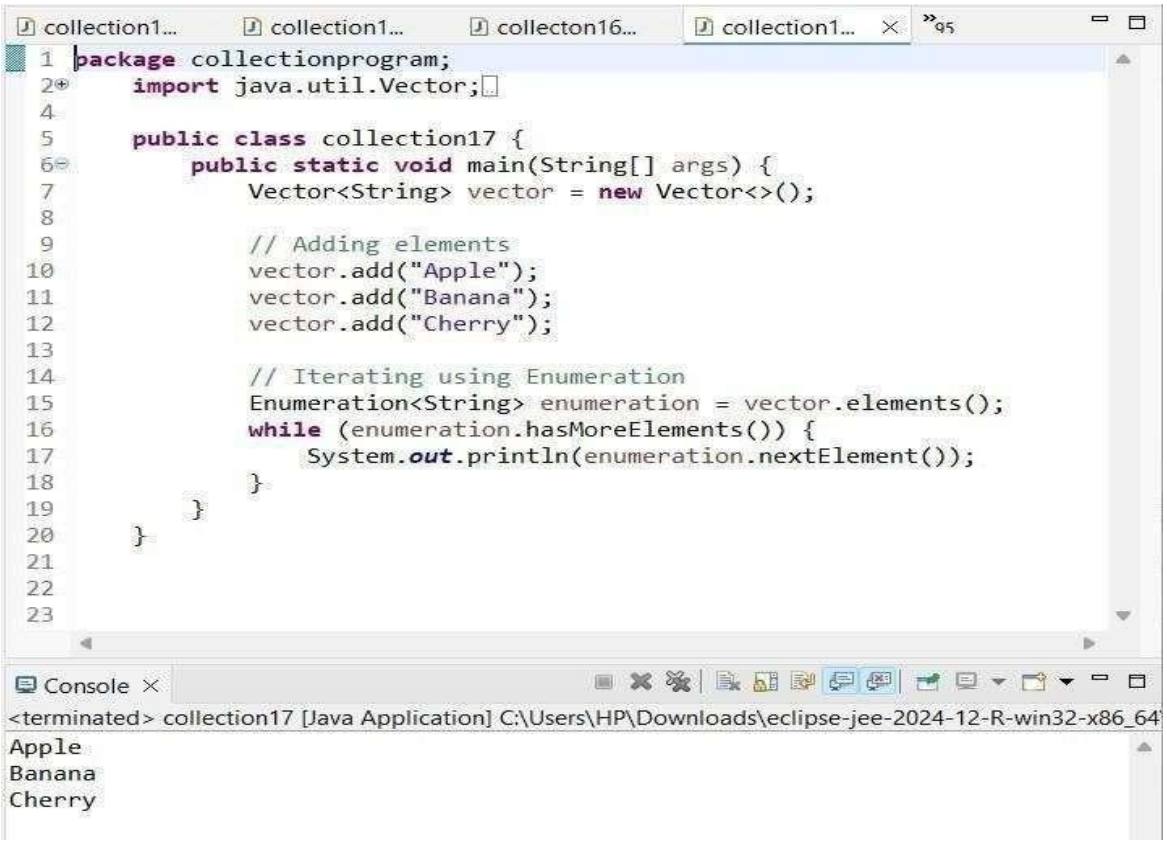
Implement a programto demonstrate



```
package collectionprogram;
    import java.util.Vector;

    public class collecton16 {
        public static void main(String[] args) {
            Vector<String> vector = new Vector<>();

            // Adding elements
            vector.add("Apple");
            vector.add("Banana");
            vector.add("Cherry");

            // Removing element
            vector.remove("Banana");

            // Iterating over elements
            for (String item : vector) {
                System.out.println(item);
            }
        }
    }
```

```
<terminated> collecton16 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86
Apple
Cherry
```

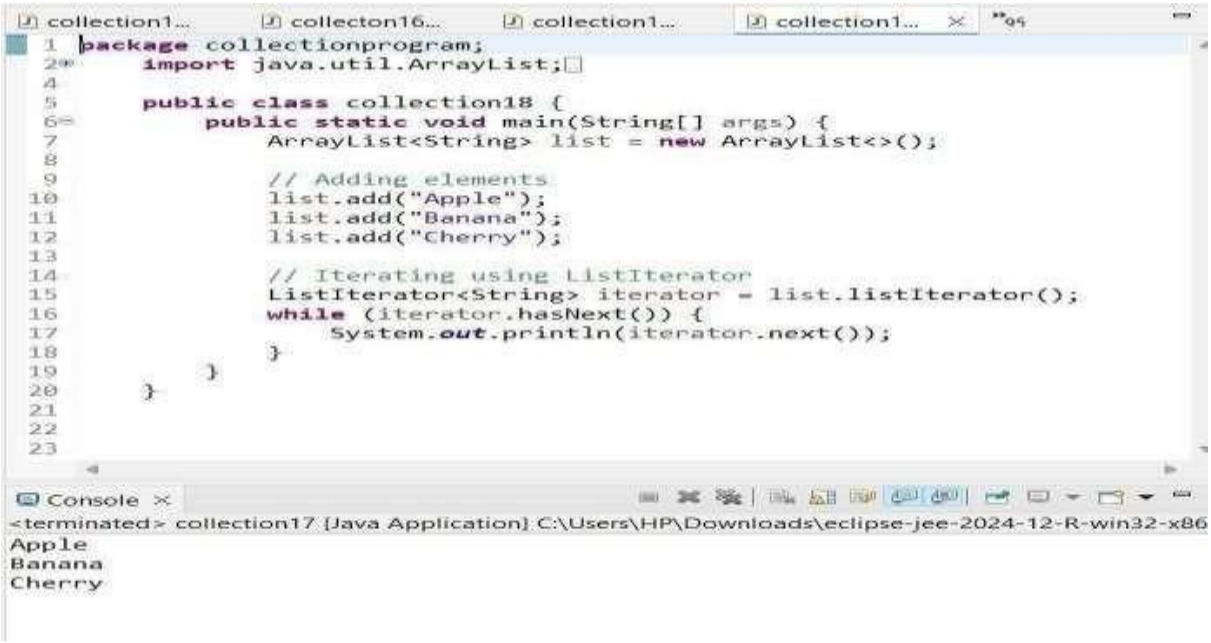
17. Write a program to demonstrate Enumeration by iterating over elements of a collection.



```
package collectionprogram;
    import java.util.Vector;

    public class collection17 {
        public static void main(String[] args) {
            Vector<String> vector = new Vector<>();

            // Adding elements
            vector.add("Apple");
            vector.add("Banana");
            vector.add("Cherry");

            // Iterating using Enumeration
            Enumeration<String> enumeration = vector.elements();
            while (enumeration.hasMoreElements()) {
                System.out.println(enumeration.nextElement());
            }
        }
    }
```

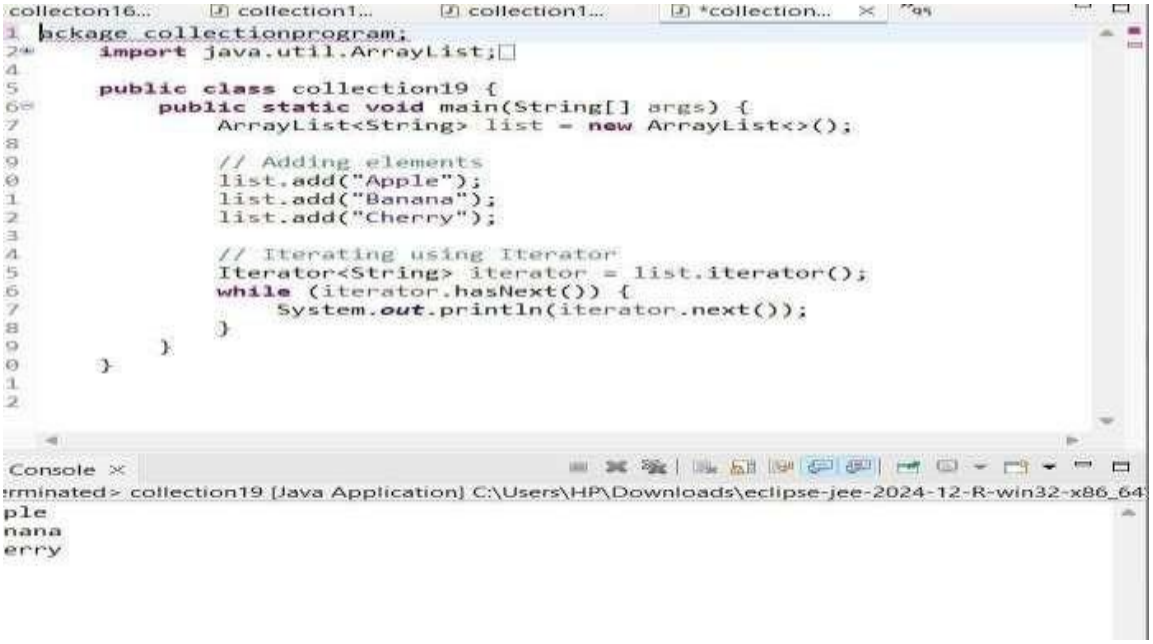
```
<terminated> collection17 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64
Apple
Banana
Cherry
```

18. Implement a program to demonstrate Listiterator by iterating over elements of a list.



```
collection1...  collecton16...  collection1...  collection1...
1  package collectionprogram;
2  import java.util.ArrayList;
4
5  public class collection18 {
6      public static void main(String[] args) {
7          ArrayList<String> list = new ArrayList<>();
8
9          // Adding elements
10         list.add("Apple");
11         list.add("Banana");
12         list.add("Cherry");
13
14         // Iterating using ListIterator
15         ListIterator<String> iterator = list.listIterator();
16         while (iterator.hasNext()) {
17             System.out.println(iterator.next());
18         }
19     }
20 }
21
22
23
Console
<terminated> collection17 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86
Apple
Banana
Cherry
```

19. Write a program to demonstrate Iterator by iterating over elements of a collection.



```
collecton16...  collection1...  collection1...  *collection...
1  ackage collectionprogram;
2  import java.util.ArrayList;
4
5  public class collection19 {
6      public static void main(String[] args) {
7          ArrayList<String> list = new ArrayList<>();
8
9          // Adding elements
0          list.add("Apple");
1          list.add("Banana");
2          list.add("Cherry");
3
4          // Iterating using Iterator
5          Iterator<String> iterator = list.iterator();
6          while (iterator.hasNext()) {
7              System.out.println(iterator.next());
8          }
9      }
0  }
1
2
Console
rminated> collection19 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64
ple
nana
erry
```

20. ArrayBlockingQueue by adding, removing, and Q iterating over elements.

Implement a program to demonstrate

```java
package collectionprogram;
    import java.util.concurrent.ArrayBlockingQueue;

    public class collection20 {
        public static void main(String[] args) throws InterruptedExcept
            ArrayBlockingQueue<String> queue = new ArrayBlockingQueue<>

            // Adding elements
            queue.put("Apple");
            queue.put("Banana");

            // Removing elements
            System.out.println("Removed: " + queue.take());

            // Iterating over elements
            for (String item : queue) {
                System.out.println(item);
            }
        }
    }
```

```
Console
<terminated> collection20 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64
Removed: Apple
Banana
```

21. Write a program to demonstrate LinkedBlockingQueue by adding, removing, and iterating over elements.

```java
package collectionprogram;
    import java.util.concurrent.LinkedBlockingQueue;

    public class collection21 {
        public static void main(String[] args) throws InterruptedExcept
            LinkedBlockingQueue<String> queue = new LinkedBlockingQueue

            // Adding elements
            queue.put("Apple");
            queue.put("Banana");

            // Removing elements
            System.out.println("Removed: " + queue.take());

            // Iterating over elements
            for (String item : queue) {
                System.out.println(item);
            }
        }
    }
```

```
Console
<terminated> collection21 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_
Removed: Apple
Banana
```

Implement a program to demonstrate

22. Priority BlockingQueue by adding, removing, and iterating over elements.

```java
package collectionprogram;
    import java.util.concurrent.PriorityBlockingQueue;

    public class collection22 {
        public static void main(String[] args) throws InterruptedExcept
            PriorityBlockingQueue<String> queue = new PriorityBlockingQ

            // Adding elements
            queue.put("Apple");
            queue.put("Banana");

            // Removing elements
            System.out.println("Removed: " + queue.take());

            // Iterating over elements
            for (String item : queue) {
                System.out.println(item);
            }
        }
    }
```

```
<terminated> collection22 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_6
Removed: Apple
Banana
```

23. Write a program to demonstrate Synchronous Queue by adding and removing elements.

```java
package collectionprogram;
    import java.util.concurrent.SynchronousQueue;

    public class collection23 {
        public static void main(String[] args) throws InterruptedExcept
            SynchronousQueue<String> queue = new SynchronousQueue<>();

            // Adding and removing elements
            new Thread(() -> {
                try {
                    queue.put("Apple");
                } catch (InterruptedException e) {
                    Thread.currentThread().interrupt();
                }
            }).start();

            // Removing element
            System.out.println("Removed: " + queue.take());
        }
    }
```

```
<terminated> collection23 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64
Removed: Apple
```

Implement a program to demonstrate

24. DelayQueue by adding and retrieving elements.

```
collection2...  collection2...  collection2...  collection2...
1  package collectionprogram;
2+     import java.util.concurrent.DelayQueue;
5
6      class DelayedItem implements Delayed {
7          private String item;
8          private long delayTime;
9
10         public DelayedItem(String item, long delayTime) {
11             this.item = item;
12             this.delayTime = delayTime + System.currentTimeMillis();
13         }
14
15         @Override
16         public long getDelay(TimeUnit unit) {
17             return unit.convert(delayTime - System.currentTimeMillis(),
18         }
19
20         @Override
21         public int compareTo(Delayed o) {
22             return Long.compare(this.delayTime, ((DelayedItem) o).delay
23         }
24
```

```
Console ×
collection24 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\eclipse\plu
Taken: Banana
```

25. Write a program to demonstrate ConcurrentLinkedQueue by adding, removing, and iterating over elements.

```
collection2...  collection2...  collection2...  collection2...
1  package collectionprogram;
2      import java.util.concurrent.ConcurrentLinkedQueue;
3
4      public class collection25 {
5          public static void main(String[] args) {
6              ConcurrentLinkedQueue<String> queue = new ConcurrentLinkedQ
7              queue.add("Apple");
8              queue.add("Banana");
9
10             System.out.println("Removed: " + queue.poll());
11             for (String item : queue) {
12                 System.out.println(item);
13             }
14         }
15     }
16
```

```
Console ×
<terminated> collection25 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_
Removed: Apple
Banana
```

Multi Threading:

Implement a program to demonstrate

1. Write a Java program to create multiple threads and display their names.

```java
package multithreading;

public class multi1 extends Thread {
        public void run() {
            System.out.println("Thread Name: " + Thread.currentThread()
        }

        public static void main(String[] args) {
            multi1 t1 = new multi1();
            multi1 t2 = new multi1();
            t1.start();
            t2.start();
        }
    }
```

```
<terminated> multi1 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecli
Thread Name: Thread-0
Thread Name: Thread-1
```

2. Implement a program to demonstrate thread synchronization using synchronized blocks.

```java
package multithreading;

    class Counter {
        private int count = 0;

        public void increment() {
            synchronized (this) {
                count++;
            }
        }

        public int getCount() {
            return count;
        }
    }

    public class SynchronizedBlockmuti2 {
        public static void main(String[] args) throws InterruptedExcept
            Counter counter = new Counter();
            Thread t1 = new Thread(() -> { for (int i = 0; i < 1000; i+
            Thread t2 = new Thread(() -> { for (int i = 0; i < 1000; i+

            t1.start();
            t2.start();
```

```
<terminated> SynchronizedBlockmuti2 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R
Final Count: 2000
```

3. Write a Java program to create multiplethreads and display their priorities.

```java
package multithreading;

class multi3  extends Thread{
        public void run() {
            System.out.println(Thread.currentThread().getName() + " Pri
        }

        public static void main(String[] args) {
            multi3  t1 = new multi3 ();
            multi3  t2 = new multi3 ();
            t1.setPriority(Thread.MIN_PRIORITY);
            t2.setPriority(Thread.MAX_PRIORITY);
            t1.start();
            t2.start();
        }
    }
```

```
Thread-1 Priority: 10
Thread-0 Priority: 1
```

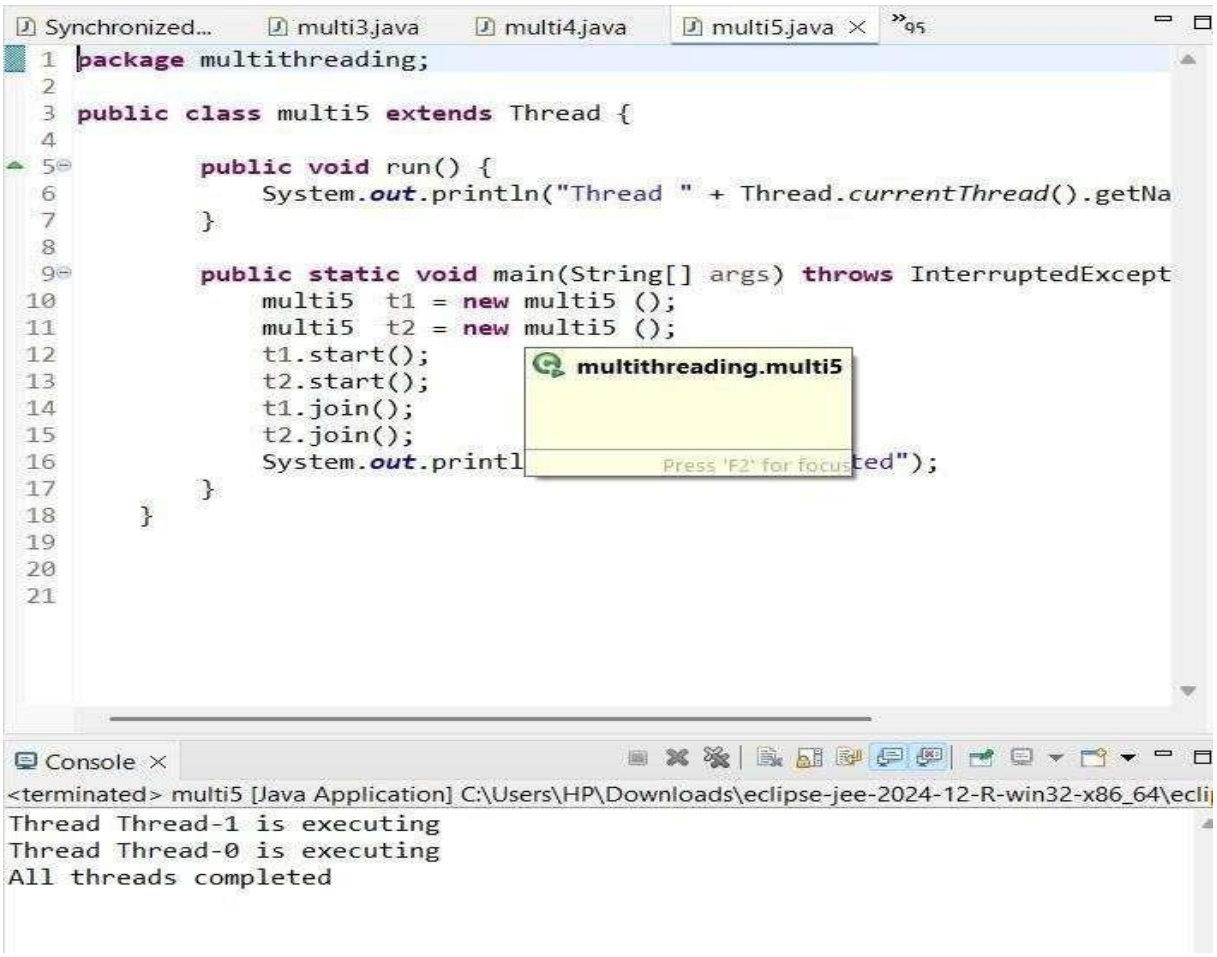
4. Implement a program to create a thread pool and execute multiple tasks using Executor Service.

```java
package multithreading;
import java.util.concurrent.ExecutorService;

class Task implements Runnable {
    public void run() {
        System.out.println("Task executed by: " + Thread.currentThread(
    }
}

public class  multi4  {
    public static void main(String[] args) {
        ExecutorService executor = Executors.newFixedThreadPool(3);
        for (int i = 0; i < 5; i++) {
            executor.submit(new Task());
        }
        exec
    }
}
```

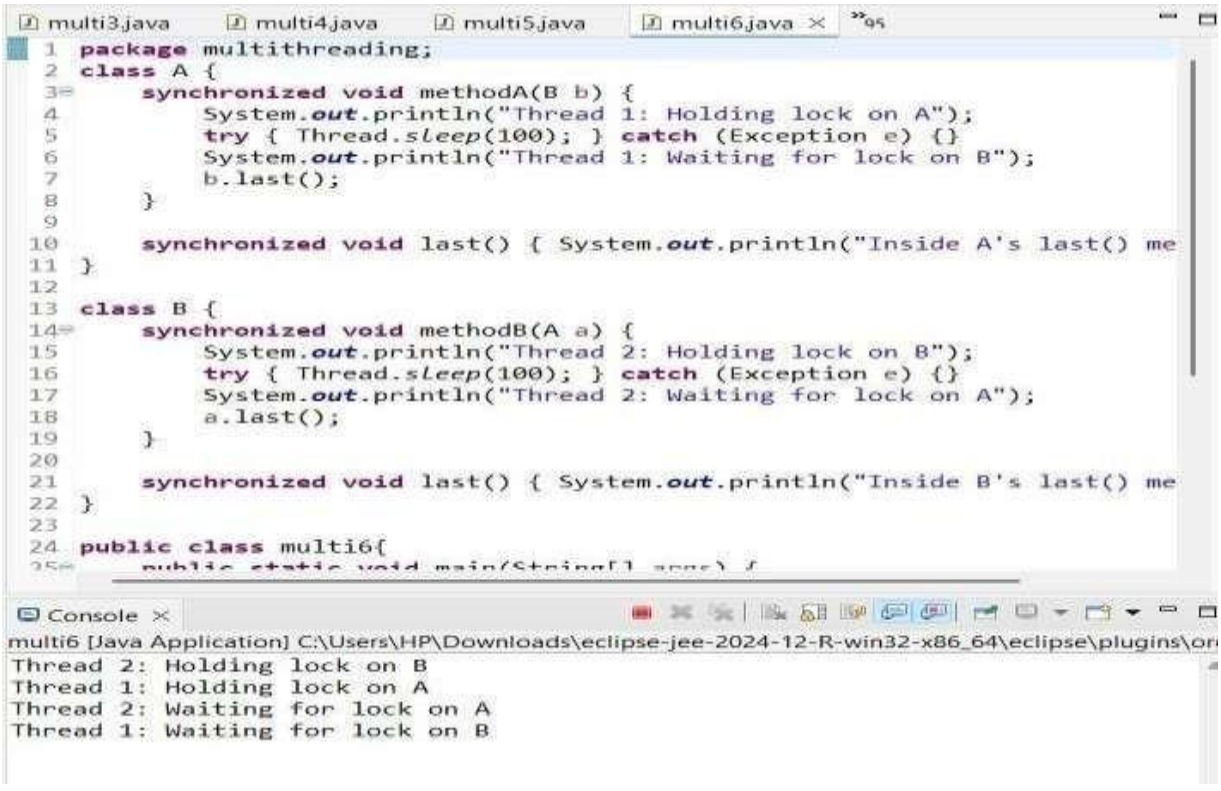
```
ExecutorService executor - multithreading.multi4.main (
    String[]
)
```

```
Task executed by: pool-1-thread-3
Task executed by: pool-1-thread-2
Task executed by: pool-1-thread-1
Task executed by: pool-1-thread-1
Task executed by: pool-1-thread-3
```

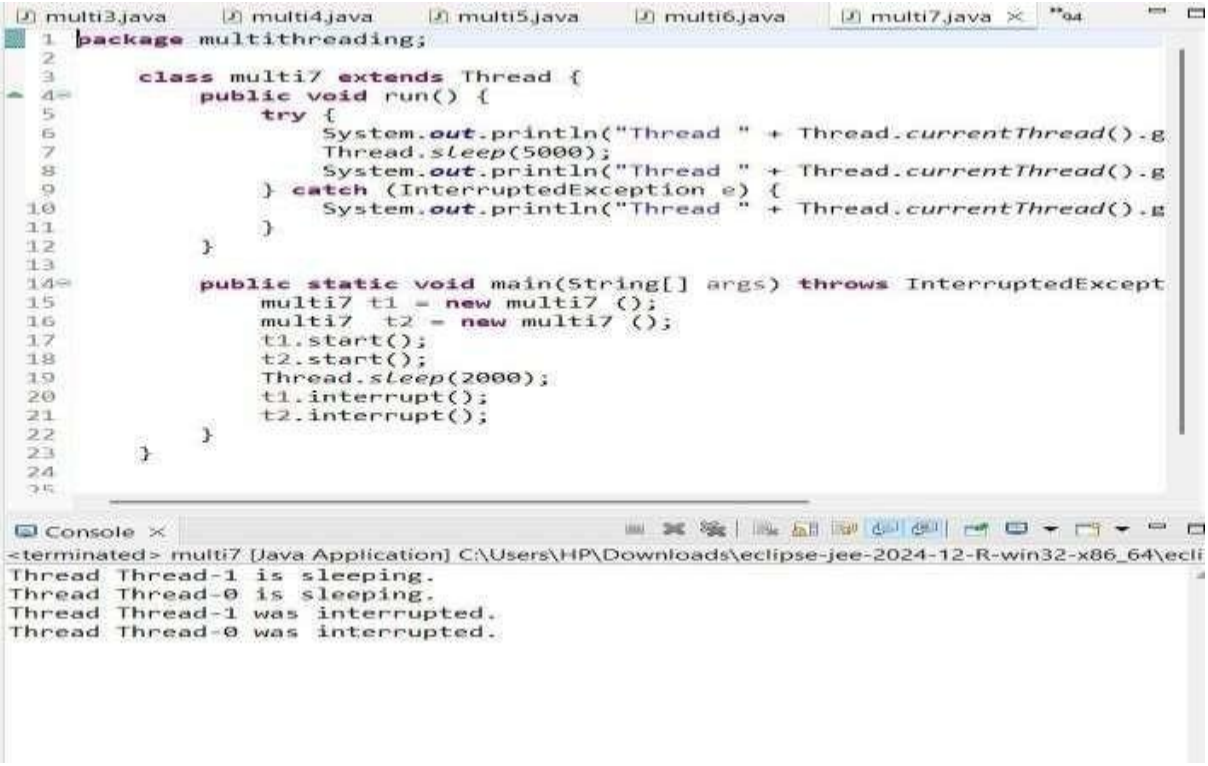
5. Write a Java program to create multiple threads and join them.



6. Implement a program to demonstrate deadlock condition in multithreading.



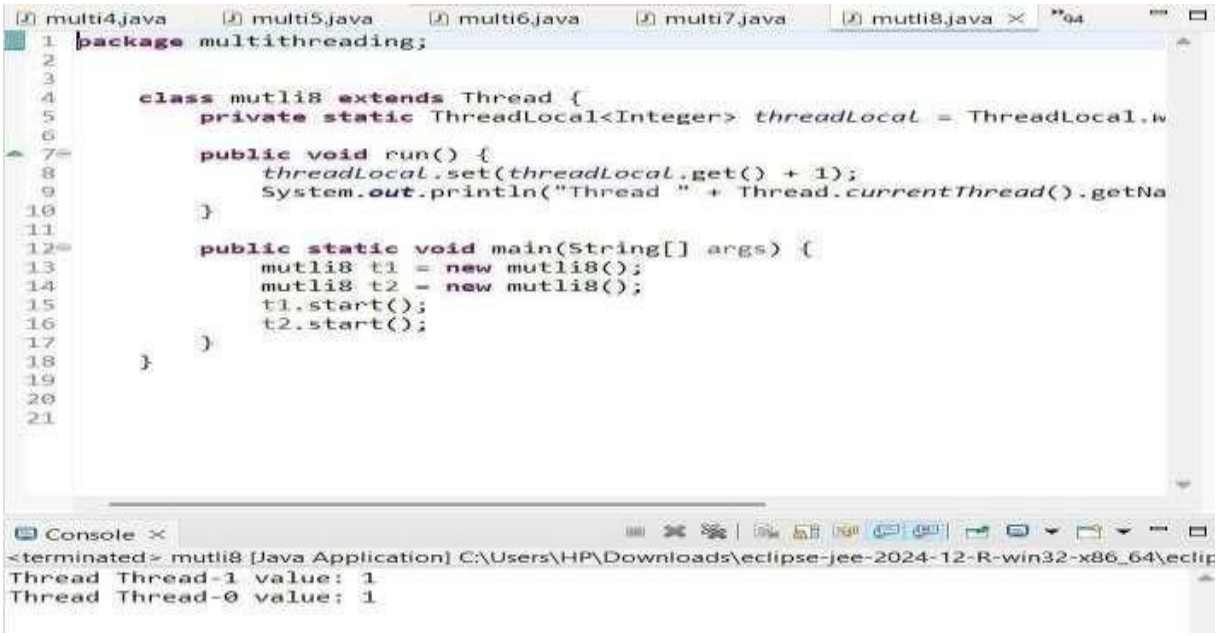
7. Write a Java program to create multiple threads and interrupt them



```
multi3.java  multi4.java  multi5.java  multi6.java  multi7.java ×

1  package multithreading;
2
3      class multi7 extends Thread {
4          public void run() {
5              try {
6                  System.out.println("Thread " + Thread.currentThread().g
7                  Thread.sleep(5000);
8                  System.out.println("Thread " + Thread.currentThread().g
9              } catch (InterruptedException e) {
10                 System.out.println("Thread " + Thread.currentThread().g
11             }
12         }
13
14         public static void main(String[] args) throws InterruptedExcept
15             multi7 t1 = new multi7 ();
16             multi7  t2 = new multi7 ();
17             t1.start();
18             t2.start();
19             Thread.sleep(2000);
20             t1.interrupt();
21             t2.interrupt();
22         }
23     }
24
```

```
Console ×
<terminated> multi7 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecli
Thread Thread-1 is sleeping.
Thread Thread-0 is sleeping.
Thread Thread-1 was interrupted.
Thread Thread-0 was interrupted.
```

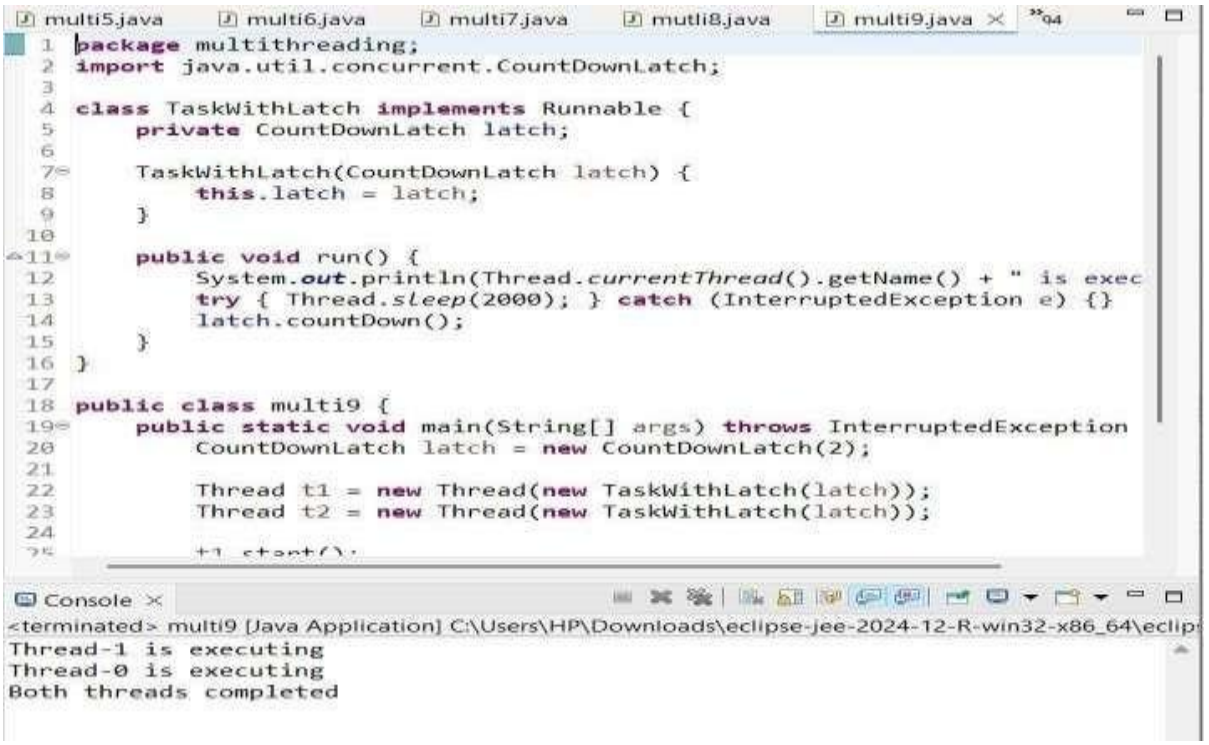
8. Implement a program to demonstrate thread local variables.



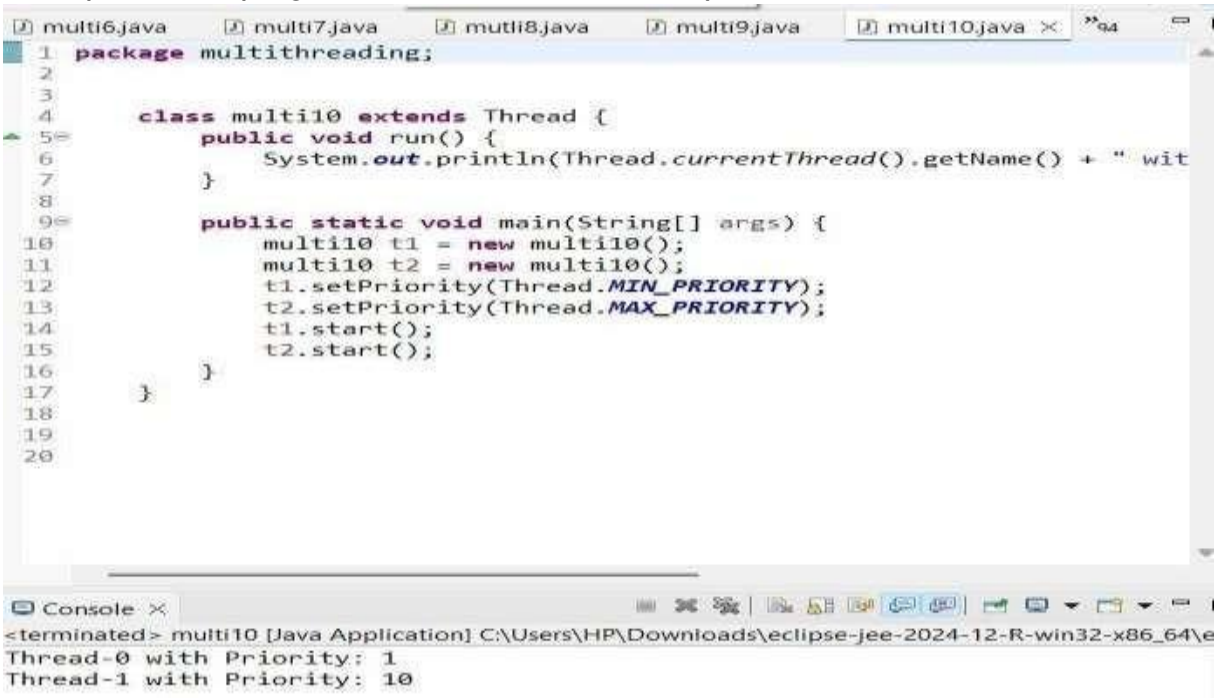
```
multi4.java  multi5.java  multi6.java  multi7.java  mutli8.java ×

1  package multithreading;
2
3
4      class mutli8 extends Thread {
5          private static ThreadLocal<Integer> threadLocal = ThreadLocal.w
6
7          public void run() {
8              threadLocal.set(threadLocal.get() + 1);
9              System.out.println("Thread " + Thread.currentThread().getNa
10         }
11
12         public static void main(String[] args) {
13             mutli8 t1 = new mutli8();
14             mutli8 t2 = new mutli8();
15             t1.start();
16             t2.start();
17         }
18     }
19
20
21
```

```
Console ×
<terminated> mutli8 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\eclip
Thread Thread-1 value: 1
Thread Thread-0 value: 1
```

9. Write a Java program to create multiple threadsand wait for them to complete using Count Down Latch.



10. Implement a program to demonstrate thread priorities in Java



11. Write a Java program to create multiple threads and use thread group.

multi7.java | mutli8.java | multi9.java | multi10.java | multi11.java

```
package multithreading;

    class  multi11 extends Thread {
        public void run() {
            System.out.println(Thread.currentThread().getName() + " in
        }

        public static void main(String[] args) {
            ThreadGroup group = new ThreadGroup("Group1");

            multi11 t1 = new multi11();
            multi11 t2 = new  multi11();

            Thread t1Thread = new Thread(group, t1);
            Thread t2Thread = new Thread(group, t2);

            t1Thread.start();
            t2Thread.start();
        }
    }
```

Console

```
<terminated> multi11 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecli
Thread-2 in group Group1
Thread-3 in group Group1
```

12. Implement a program to demonstrate thread communication using wait() and notify() methods.

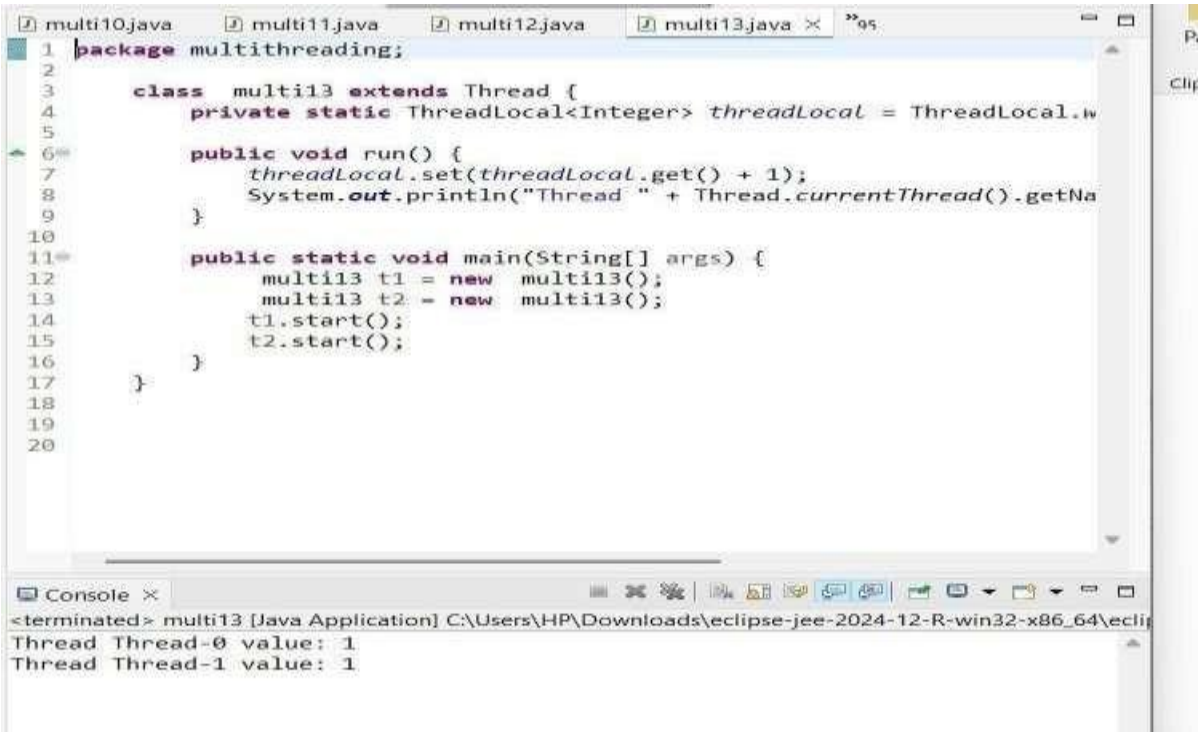
multi9.java | multi10.java | multi11.java | multi12.java

```
package multithreading;

    class multi12 {
        private static final Object lock = new Object();

        public static void main(String[] args) throws InterruptedExcept
            Thread producer = new Thread(() -> {
                synchronized (lock) {
                    try {
                        System.out.println("Producer is waiting");
                        lock.wait();
                    } catch (InterruptedException e) { e.printStackTrac
                    System.out.println("Producer resumed");
                }
            });

            Thread consumer = new Thread(() -> {
                synchronized (lock) {
                    System.out.println("Consumer is notifying");
                    lock.notify();
                }
            });

            producer.start();
```

Console

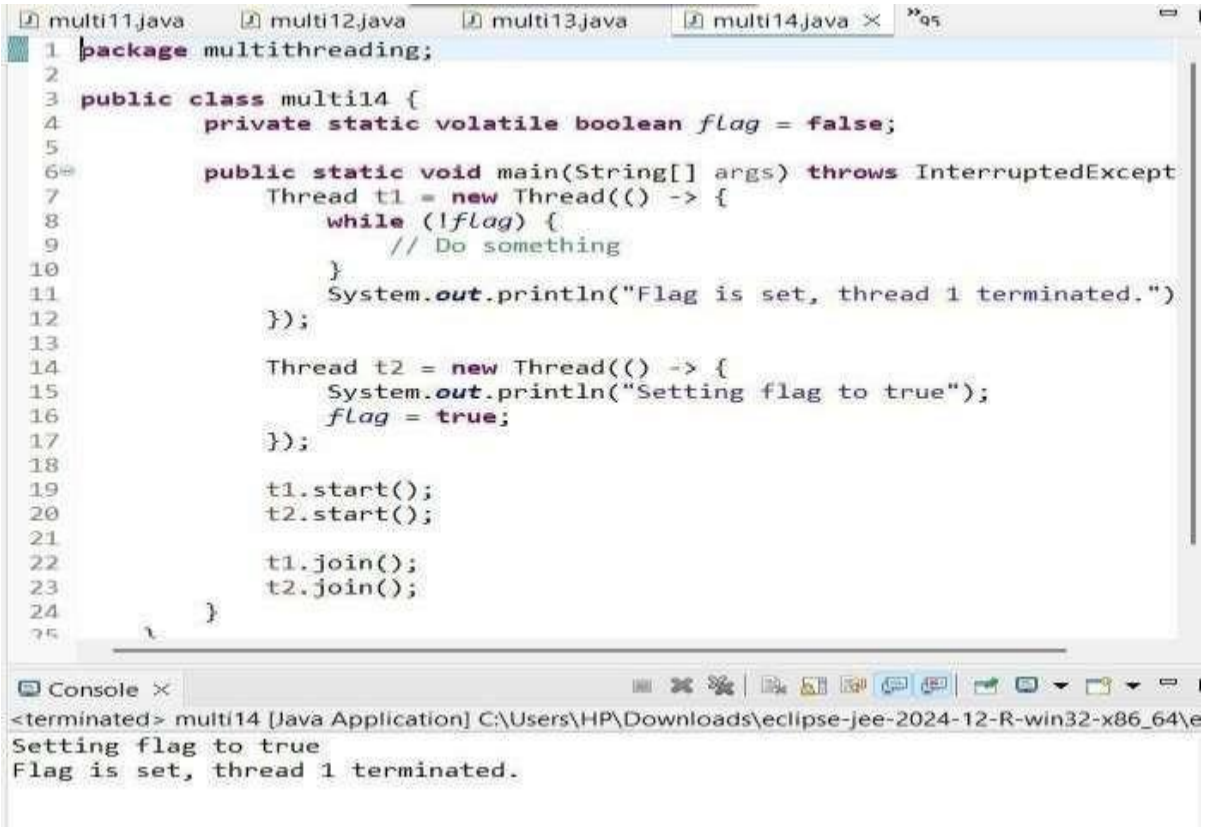
```
<terminated> multi12 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecli
Producer is waiting
Consumer is notifying
Producer resumed
```

13. Write a Java program to create multiple threads and use thread local variables.



```
multi10.java  multi11.java  multi12.java  multi13.java ×

1  package multithreading;
2
3      class  multi13 extends Thread {
4          private static ThreadLocal<Integer> threadLocal = ThreadLocal.w
5
6          public void run() {
7              threadLocal.set(threadLocal.get() + 1);
8              System.out.println("Thread " + Thread.currentThread().getNa
9          }
10
11         public static void main(String[] args) {
12              multi13 t1 = new  multi13();
13              multi13 t2 = new  multi13();
14             t1.start();
15             t2.start();
16         }
17     }
18
19
20

Console ×
<terminated> multi13 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecli
Thread Thread-0 value: 1
Thread Thread-1 value: 1
```

14. Implement a program to demonstrate thread communication using volatile keyword



```
multi11.java  multi12.java  multi13.java  multi14.java ×

1  package multithreading;
2
3  public class multi14 {
4          private static volatile boolean flag = false;
5
6          public static void main(String[] args) throws InterruptedExcept
7              Thread t1 = new Thread(() -> {
8                  while (!flag) {
9                      // Do something
10                 }
11                 System.out.println("Flag is set, thread 1 terminated.")
12             });
13
14             Thread t2 = new Thread(() -> {
15                 System.out.println("Setting flag to true");
16                 flag = true;
17             });
18
19             t1.start();
20             t2.start();
21
22             t1.join();
23             t2.join();
24         }

Console ×
<terminated> multi14 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\e
Setting flag to true
Flag is set, thread 1 terminated.
```

15. Write a Java program to create multiple threads and use Executors framework.

multi12.java × multi13.java multi14.java *multi15.java ×

practiseprograms/src/multithreading/multi12.java

```
2
3  import java.util.concurrent.ExecutorService;
5
6  class multi15 implements Runnable {
7      public void run() {
8          System.out.println(Thread.currentThread().getName() + " is
9      }
10
11     public static void main(String[] args) {
12         ExecutorService executor = Executors.newFixedThreadPool(3)
13         for (int i = 0; i < 5; i++) {
14             executor.submit(new multi15 ());
15         }
16         executor.shutdown();
17     }
18 }
19
20
21
```

Console ×

<terminated> multi15 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_6

```
pool-1-thread-3 is executing
pool-1-thread-1 is executing
pool-1-thread-2 is executing
pool-1-thread-1 is executing
pool-1-thread-3 is executing
```

16. Implement a program to demonstrate thread interruption in Java.

multi12.java multi13.java multi14.java multi15.java

```
1  package multithreading;
2
3      import java.util.concurrent.ExecutorService;
5
6      class multi15 implements Runnable {
7          public void run() {
8              System.out.println(Thread.currentThread().getName() + " is
9          }
10
11         public static void main(String[] args) {
12             ExecutorService executor = Executors.newFixedThreadPool(3);
13             for (int i = 0; i < 5; i++) {
14                 executor.submit(new multi15 ());
15             }
16             executor.shutdown();
17         }
18     }
19
20
21
```

Console

```
multi16 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\eclipse\plugins
Thread Thread-0 is sleeping.
Thread Thread-1 is sleeping.
```

17. Write a Java program to create multiple threads and use Callable and Future.

multi13.java multi14.java multi15.java multi17.java

```
1  package multithreading;
2      import java.util.concurrent.*;
3
4      class multi17 implements Callable<String> {
5          public String call() {
6              return "Thread " + Thread.currentThread().getName() + " is
7          }
8
9          public static void main(String[] args) throws ExecutionExceptio
10             ExecutorService executor = Executors.newFixedThreadPool(3);
11             multi17 task = new multi17();
12             Future<String> future = executor.submit(task);
13             System.out.println(future.get());
14             executor.shutdown();
15         }
16     }
17
18
19
```

Console

```
<terminated> multi17 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecli
Thread pool-1-thread-1 is executing.
```

18. Implement a program to demonstrate thread communication using BlockingQueue.

multi14.java multi15.java multi17.java multi18.java

```
package multithreading;
    import java.util.concurrent.*;

    class multi18 {
        public static void main(String[] args) throws InterruptedExcept
            BlockingQueue<Integer> queue = new LinkedBlockingQueue<>(10

            Thread producer = new Thread(() -> {
                try {
                    for (int i = 0; i < 5; i++) {
                        queue.put(i);
                        System.out.println("Produced: " + i);
                    }
                } catch (InterruptedException e) {
                    e.printStackTrace();
                }
            });

            Thread consumer = new Thread(() -> {
                try {
                    for (int i = 0; i < 5; i++) {
                        Integer value = queue.take();
                        System.out.println("Consumed: " + value);
                    }
```

Console

```
<terminated> multi18 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\e
Consumed: 0
Produced: 0
Produced: 1
Consumed: 1
Consumed: 2
Produced: 2
Produced: 3
Produced: 4
Consumed: 3
Consumed: 4
```

19. Write a Java program to create multiple threads and use Phaser

multi15.java multi17.java multi18.java multi19.java

```
package multithreading;
    import java.util.concurrent.*;

    class multi19  {
        public static void main(String[] args) {
            Phaser phaser = new Phaser(1);

            Runnable task = () -> {
                System.out.println(Thread.currentThread().getName() + "
                phaser.arriveAndAwaitAdvance();
            };

            Thread t1 = new Thread(task);
            Thread t2 = new Thread(task);

            t1.start();
            t2.start();

            phaser.arriveAndAwaitAdvance();
            System.out.println("All threads completed.");
        }
    }
```

Console

```
<terminated> multi19 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\ecli
All threads completed.
Thread-1 is doing the work.
Thread-0 is doing the work.
```

20. Implement a program to demonstrate thread communication using CyclicBarrier

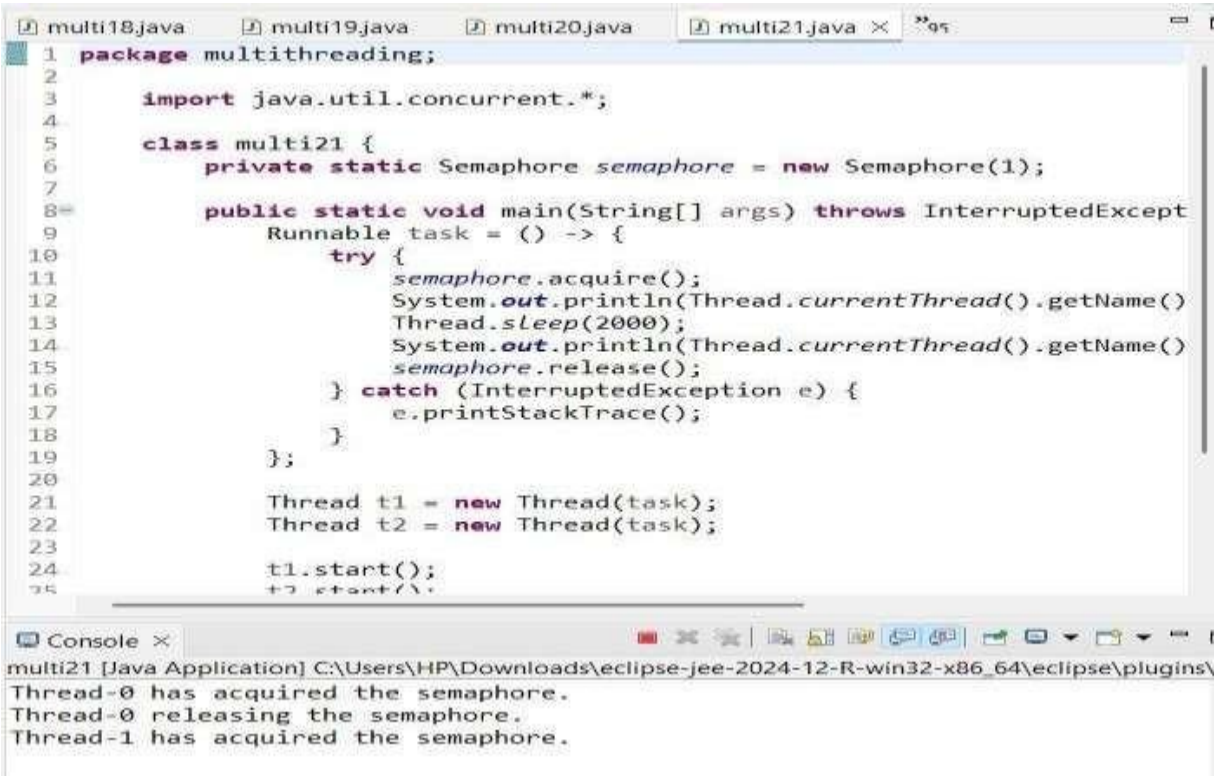
multi17.java multi18.java multi19.java multi20.java

```java
package multithreading;

    import java.util.concurrent.*;

    class multi20 {
        public static void main(String[] args) throws InterruptedExce
            CyclicBarrier barrier = new CyclicBarrier(2, () -> System

            Runnable task = () -> {
                System.out.println(Thread.currentThread().getName() +
                try {
                    barrier.await();
                } catch (InterruptedException | BrokenBarrierExceptic
                    e.printStackTrace();
                }
            };

            Thread t1 = new Thread(task);
            Thread t2 = new Thread(task);

            t1.start();
            t2.start();
            t1.join();
            t2.join();
        }
```

Console

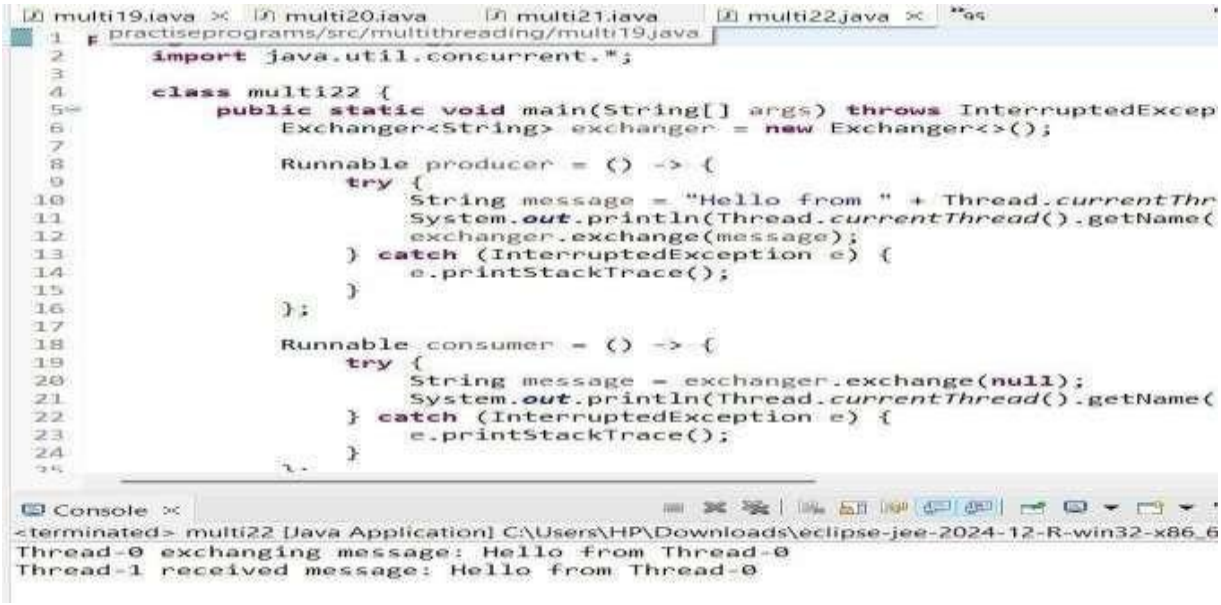
```
<terminated> multi20 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86
Thread-0 is waiting at the barrier
Thread-1 is waiting at the barrier
All threads reached the barrier
```

21. Write a Java program to create multiple threads and use Semaphore



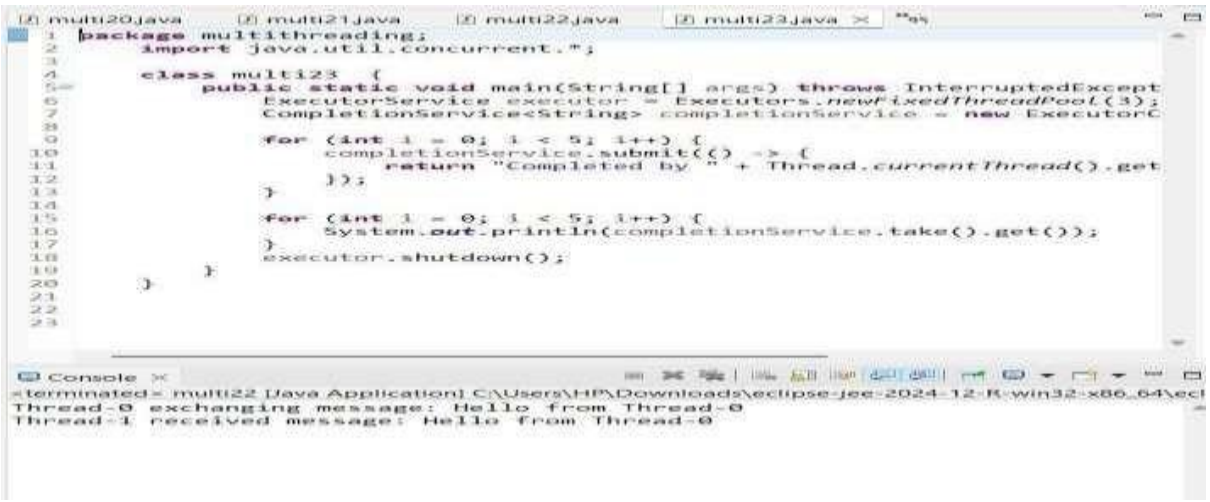
```
multi18.java  multi19.java  multi20.java  multi21.java ×

1  package multithreading;
2
3      import java.util.concurrent.*;
4
5      class multi21 {
6          private static Semaphore semaphore = new Semaphore(1);
7
8          public static void main(String[] args) throws InterruptedExcept
9              Runnable task = () -> {
10                 try {
11                     semaphore.acquire();
12                     System.out.println(Thread.currentThread().getName()
13                     Thread.sleep(2000);
14                     System.out.println(Thread.currentThread().getName()
15                     semaphore.release();
16                 } catch (InterruptedException e) {
17                     e.printStackTrace();
18                 }
19             };
20
21             Thread t1 = new Thread(task);
22             Thread t2 = new Thread(task);
23
24             t1.start();

Console ×
multi21 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\eclipse\plugins\
Thread-0 has acquired the semaphore.
Thread-0 releasing the semaphore.
Thread-1 has acquired the semaphore.
```

22. Implement a program to demonstrate thread communication using Exchanger.

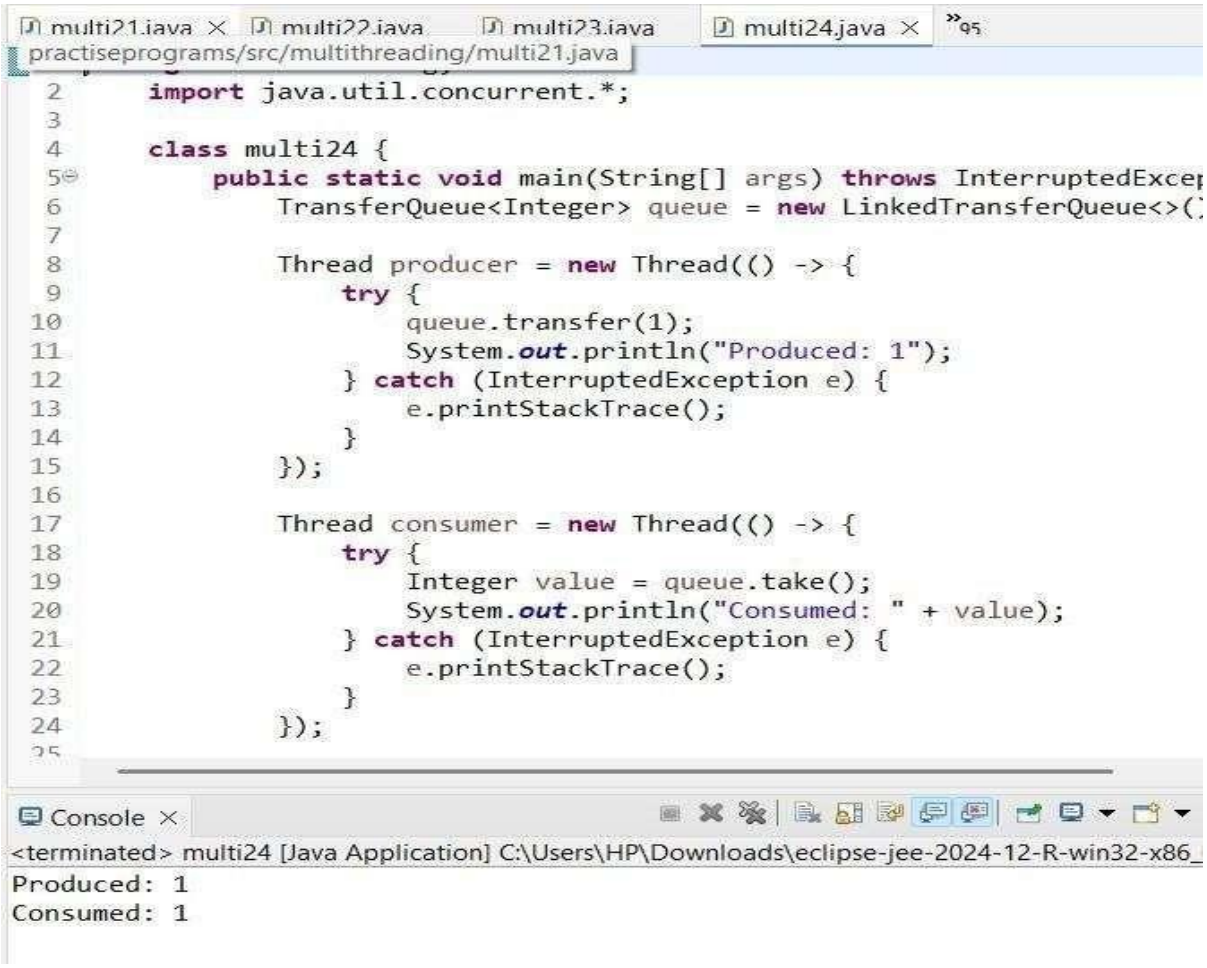


```
multi19.java ×  multi20.java  multi21.java  multi22.java ×
practiseprograms/src/multithreading/multi19.java
1  import java.util.concurrent.*;
2
3  class multi22 {
4      public static void main(String[] args) throws InterruptedExcep
5          Exchanger<String> exchanger = new Exchanger<>();
6
7          Runnable producer = () -> {
8              try {
9                  String message = "Hello from " + Thread.currentThr
10                 System.out.println(Thread.currentThread().getName(
11                 exchanger.exchange(message);
12             } catch (InterruptedException e) {
13                 e.printStackTrace();
14             }
15         };
16
17         Runnable consumer = () -> {
18             try {
19                 String message = exchanger.exchange(null);
20                 System.out.println(Thread.currentThread().getName(
21             } catch (InterruptedException e) {
22                 e.printStackTrace();
23             }

Console ×
<terminated> multi22 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_6
Thread-0 exchanging message: Hello from Thread-0
Thread-1 received message: Hello from Thread-0
```

23. Write a Java program to create multiple threads and use CompletionService



24. Implement a program to demonstrate thread communication using TransferQueue.



25. Write a Java program to create multiple threads and use Scheduled Executor Service.

multi22.java multi23.java multi24.java multi25.java

```
1  package multithreading;
2      import java.util.concurrent.*;
3
4      class multi25 {
5          public static void main(String[] args) {
6              ScheduledExecutorService scheduler = Executors.newScheduled
7
8              Runnable task = () -> System.out.println("Task executed at:
9
10             scheduler.scheduleAtFixedRate(task, 0, 2, TimeUnit.SECONDS)
11         }
12     }
13
14
15
```

Console

```
multi25 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\eclipse\plugins\c
Task executed at: 1740910310354
Task executed at: 1740910312353
```

26. Implement a program to demonstrate thread communication using Lock and Condition.

multi23.java multi24.java multi25.java multi26.java

```
1  package multithreading;
2      import java.util.concurrent.locks.*;
3
4      class multi26 {
5          private static Lock lock = new ReentrantLock();
6          private static Condition condition = lock.newCondition();
7
8          public static void main(String[] args) throws InterruptedExcept
9              Thread producer = new Thread(() -> {
10                 lock.lock();
11                 try {
12                     System.out.println("Producer is working.");
13                     condition.await();
14                     System.out.println("Producer resumed.");
15                 } catch (InterruptedException e) {
16                     e.printStackTrace();
17                 } finally {
18                     lock.unlock();
19                 }
20             });
21
22             Thread consumer = new Thread(() -> {
23                 lock.lock();
24                 try {
25                     System.out.println("Consumer is notifying");
```

Console

```
multi26 [Java Application] C:\Users\HP\Downloads\eclipse-jee-2024-12-R-win32-x86_64\eclipse\plugins\org
Consumer is notifying
Producer is working.
```