**Java**

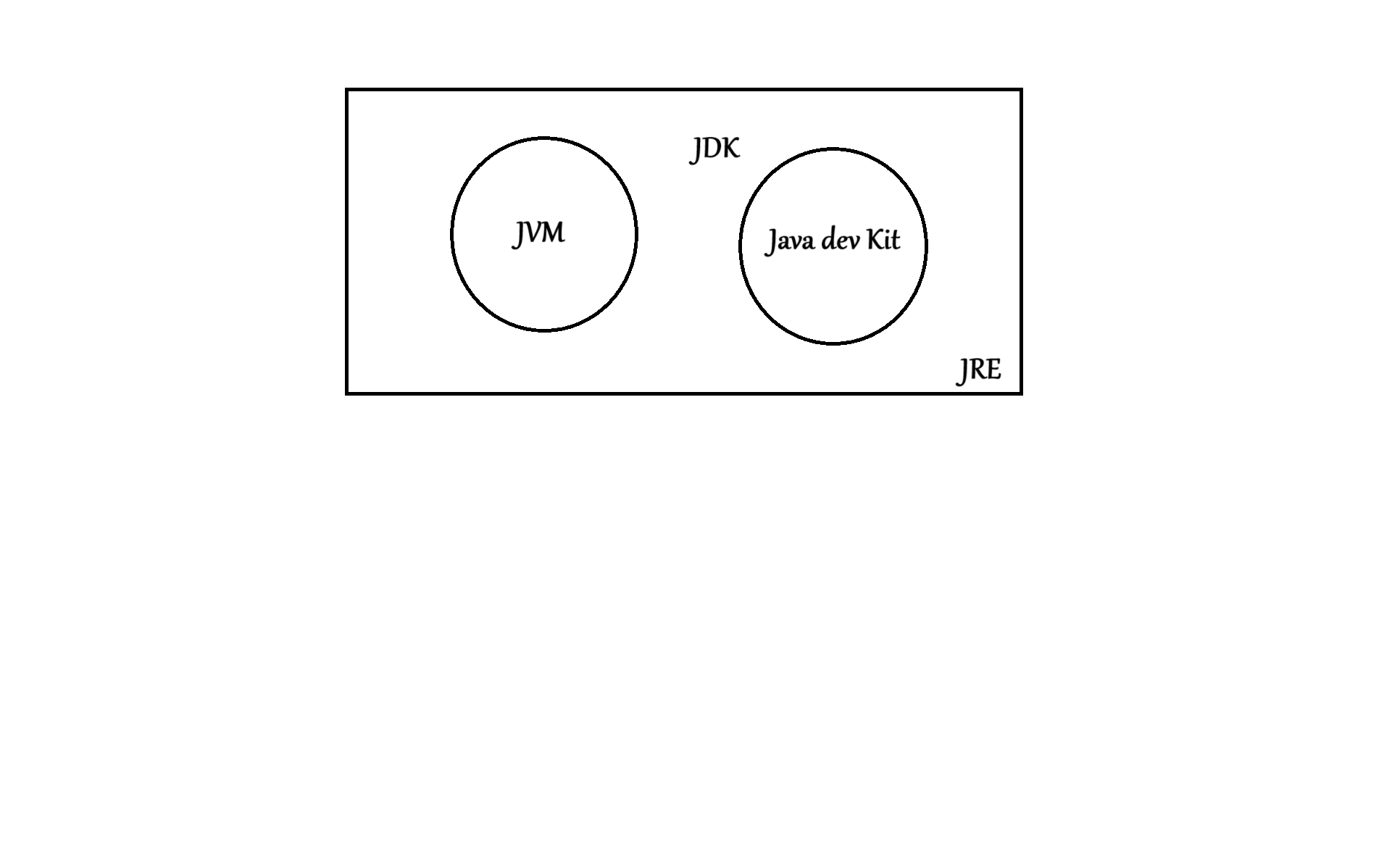
# **Java History**

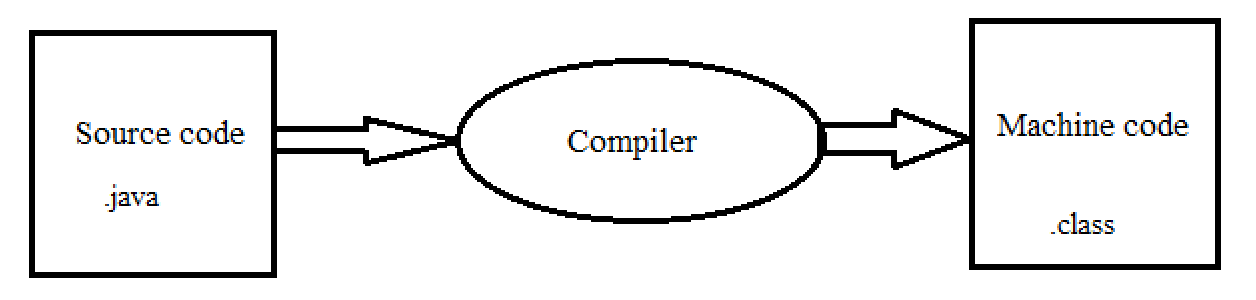
* It was developed by Sun microsystems.

# **Features**

* Java is a high-level object-oriented programming language.
* Java is platform-independent.
* It supports multithreading for multitasking.

# **JDK (Java Development Kit)**





\***Note**

* Byte Code is Universally accepted language

# **Applications of java**

* Desktop applications
* Web applications

# **Programming Knowledge**

***Syntax:***

**class** class\_name {

//Functions and methods to be declared

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

// main code logics

}

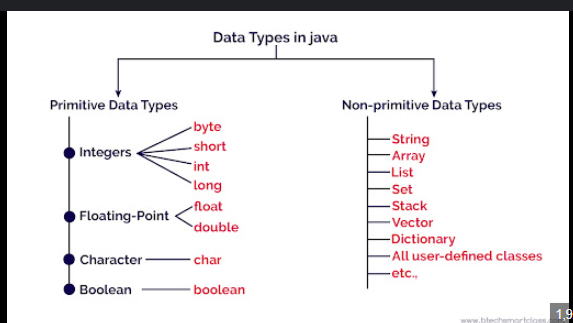
}

\***Note**

* A program cannot be run without the main method.

# **Data Types**

* Primitive
* Non – primitive



Memory space required to store datatypes:

* ***byte:*** 8 bits
* ***short:*** 4 bytes
* ***float:*** 4 bytes
* ***double:*** 8 bytes
* ***char:*** 2 bytes

# **Scanner class**

***Syntax:*** Scanner sc = new scanner(System.in); // for taking input

# **Conditional statements**

* + - 1. **if else condition**

**Syntax:**

if (condition) {

// operations

} else {

// operations if condition fails

}

* + - 1. **else if condition**

**Syntax:**

if (condition 1) {

// operations

} else if (condition 2) {

// operations if condition 1 fails

}

.

.

else {

// operations if all above conditions fail

}

* + - 1. **switch case**

***Syntax:***

switch (expression) {

case const\_expr1:

// operations

break;

case const\_expr2:

// operations

break;

.

.

default:

// operations

break;

}

# **Loops:**

1. **for loop**

***Syntax:***

for (initialization; condition; updation) {

// loop body

}

1. **while loop**

***Syntax:***

initialization;

while (condition) {

// loop body

updation;

}

1. **do-while loop**

***Syntax:***

initialization;

do {

// loop body

updation;

} while (condition);

# **Functions**

* A function commonly called a method is a block of code that performs a specific task and can be reused.
* Java methods are defined inside a class and are used to perform operations, results on data.
* Function name should not be any keyword.

***Syntax:***

return \_type function\_name(parameters) {

// function body

}

# **Array**

An array in java is a collection of elements (values or variables) each identified by an index or a key. All elements in an array are of the same datatype.

***Syntax:*** datatype[] var\_name = new datatype[size];

***Why use arrays?***

* To store multiple values in a single variable
* To avoid creating multiple variables
* Helps in iterating over a set of values using loops

\***Note**

* Array size cannot be altered after creating.
* It follows 0(zero) based indexing

***Q. Take an array as input from the user. Search for a given number x and print the index at which it occurs.***

***Program***

**import** **java.util.Scanner**;

**public** **class** search {

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

*Scanner* sc **=** **new** Scanner(System.in);

        System.out.print("Enter the size of the array: ");

*int* n **=** sc.nextInt();

*int*[] arr **=** **new** *int*[n];

        System.out.println("Enter the elements of the array:");

**for** (*int* i **=** 0; i **<** n; i**++**) {

            arr[i] **=** sc.nextInt();

        }

        System.out.print("Enter the number to search for: ");

*int* x **=** sc.nextInt();

*int* index **=** **-**1;

**for** (*int* i **=** 0; i **<** n; i**++**) {

**if** (arr[i] **==** x) {

                index **=** i;

**break**;

            }

        }

**if** (index **!=** **-**1) {

            System.out.println("Number found at index: " **+** index);

        } **else** {

            System.out.println("Number not found in the array.");

        }

        sc.close();

    }

}

***Q. Take input in 2d array***

**import** **java.util.Scanner**;

**public** **class** twodarray {

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

*Scanner* sc **=** **new** Scanner(System.in);

        System.out.print("Enter number of rows: ");

*int* rows **=** sc.nextInt();

        System.out.print("Enter number of columns: ");

*int* cols **=** sc.nextInt();

*int*[][] array **=** **new** *int*[rows][cols];

        System.out.println("Enter the elements:");

**for** (*int* row **=** 0; row **<** rows; row**++**) {

**for** (*int* col **=** 0; col **<** cols; col**++**) {

                array[row][col] **=** sc.nextInt();

            }

        }

        System.out.println("The array is:");

**for** (*int* row **=** 0; row **<** array.length; row**++**) {

**for** (*int* col **=** 0; col **<** array[row].length; col**++**) {

                System.out.print(array[row][col] **+** " ");

            }

            System.out.println();

        }

        sc.close();

    }

}

**Strings**

***Program***

**public** **class** strings {

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

*String* str1 **=** "Hello";

*String* str2 **=** "World";

        // Concatenating strings

*String* result1 **=** str1 **+** " " **+** str2;

        System.out.println("Using + operator: " **+** result1);

        System.out.println("Printing the string one char at a time: ");

**for** (*int* i **=** 0; i **<** str1.length(); i**++**) {

            System.out.print(str1.charAt(i) **+** " ");

        }

        System.out.println();

*String* result2 **=** str1.concat(" ").concat(str2);

        System.out.println("Using concat() method: " **+** result2);

        // Comparison of strings

*String* str3 **=** "Hello";

*String* str4 **=** "hello";

        System.out.println("Comparing strings using equals(): " **+** str3.equals(str4));

        System.out.println("Comparing strings using equalsIgnoreCase(): " **+** str3.equalsIgnoreCase(str4));

        System.out.println("Comparing strings using compareTo(): " **+** str3.compareTo(str4));

        System.out.println("Comparing strings using compareToIgnoreCase(): " **+** str3.compareToIgnoreCase(str4));

        System.out.println("Comparing strings using == operator: " **+** (str3 **==** str4));

        // substring example

*String* str5 **=** "Hello, World!";

*String* subStr1 **=** str5.substring(0, 5);

*String* subStr2 **=** str5.substring(7);

        System.out.println("Substring of '" **+** str5 **+** "': " **+** subStr1 **+** " and " **+** subStr2);

    }

}

**StringBuilder**

***Syntax:*** StringBuilder sb = new StringBuilder(any string);

***Program: Reverse a string***

**public** **class** stringreverse {

**public** **static** *String* reverse(*String* *input*) {

*StringBuilder* sb **=** **new** StringBuilder(input);

**for** (*int* front **=** 0, back **=** sb.length() **-** 1; front **<** back; front**++**, back**--**) {

*char* temp **=** sb.charAt(front);

            sb.setCharAt(front, sb.charAt(back));

            sb.setCharAt(back, temp);

        }

**return** sb.toString();

    }

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

*String* str **=** "Hello";

        System.out.println("Original String: " **+** str);

        System.out.println("Reversed String: " **+** reverse(str));

    }

}

# **OOP**

* Java is an object-oriented programming language. Everything in Java revolves around objects and classes.
* It has 4 pillars:

1. Encapsulation
2. Abstraction
3. Polymorphism
4. Inheritance

**Constructor**

* It is called automatically when an object of class is created.
* It has the same name as the class.
* Doesn’t have any return type ***(not even void)***.
* It used to initialize the object.

***Types of constructors***

1. Default constructor (Non-Parameterized)
2. Parameterized constructor
3. Copy constructor

***Program***

**class** pen {

*String* color;

*String* type;

**public** pen(*String* *color*, *String* *type*) {

        this.color **=** color;

        this.type **=** type;

    }

**public** *void* write() {

        System.out.println("Writing with " **+** type **+** " pen of color " **+** color);

    }

}

**class** Student {

*String* name;

*int* age;

**public** Student(*String* *name*, *int* *age*) {

        this.name **=** name;

        this.age **=** age;

    }

**public** *void* display(){

        System.out.println("Name: " **+** name **+** ", Age: " **+** age);

    }

**public** Student(*Student* *sh*) {

        this.name **=** sh.name;

        this.age **=** sh.age;

    }

}

**public** **class** oops {

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

        pen p1 **=** **new** pen("blue", "ball-point");

        p1.write();

        pen p2 **=** **new** pen("red", "gel");

        p2.write();

*Student* s1 **=** **new** Student("Alice", 20);

        s1.display();

*Student* s2 **=** **new** Student("Bob", 22);

        s2.display();

*Student* s3 **=** **new** Student(s1);

        s3.display();

    }

}

# **Garbage collections:**

Java don’t have the destructors it uses the concept of garbage collector.

# **Inheritance**

Inheritance is a mechanism by which one class acquires the properties and behaviors of another class.

**Types of inheritance**

Parent

Child

# **Polymorphism**

# It enables run time polymorphism via method overriding. Code maintenance is easy with polymorphism.

# 

# **Programs**

# **Demo Program**

**public class demo {**

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

**System.out.println("Hello World");**

**}**

**}**

# **Pattern Printing**

**public** **class** patternprinting {

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

*int* n **=** 4;

**for** (*int* i **=** 0; i **<** n; i**++**) {

**for** (*int* j **=** 0; j **<** n; j**++**) {

                System.out.print(" \* ");

            }

            System.out.println();

        }

**for** (*int* i **=** 1; i **<=** n; i**++**) {

**for** (*int* j **=** 1; j **<=** i; j**++**) {

                System.out.print(" \* ");

            }

            System.out.println();

        }

**for** (*int* i **=** 1; i **<=** n; i**++**) {

**for** (*int* j **=** 1; j **<=** 4; j**++**) {

**if** (i **==** 1 **||** i **==** n **||** j **==** 1 **||** j **==** n) {

                    System.out.print(" \* ");

                } **else** {

                    System.out.print("   ");

                }

            }

            System.out.println();

        }

 int k=1;

        for (int i = 1; i <= n; i++) {

            for (int j = 1; j <= i; j++) {

                System.out.print(k + " ");

                k++;

            }

            System.out.println();

        }

    }

}

# **Even Odd**

public class evenodd {

    public static void main(String[] args) {

        java.util.Scanner sc = new java.util.Scanner(System.in);

        System.out.print("Enter a number: ");

        int num = sc.nextInt();

        if (num % 2 == 0) {

            System.out.println(num + " is even.");

        } else {

            System.out.println(num + " is odd.");

        }

        sc.close();

    }

}

**Prime number**

**import** **java.util.Scanner**;

**public** **class** primenum {

**public** *boolean* prime(*int* *num*) {

*boolean* isPrime **=** true;

**if** (num **<=** 1) {

            isPrime **=** false;

        } **else** {

**for** (*int* i **=** 2; i **<=** Math.sqrt(num); i**++**) {

**if** (num **%** i **==** 0) {

                    isPrime **=** false;

**break**;

                }

            }

        }

**return** isPrime;

    }

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

*Scanner* sc **=** **new** Scanner(System.in);

*int* num **=** sc.nextInt();

        prim**enum** p = new primenum();

        if (p.prime(num)) {

            System.out.println(num **+** " is a prime number.");

        } **else** {

            System.out.println(num **+** " is not a prime number.");

        }

        sc.close();

    }

}

# **Sum of n natural numbers**

**import** **java.util.Scanner**;

**public** **class** sumofnnaturalnumbers {

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

*Scanner* sc **=** **new** Scanner(System.in);

        System.out.print("Enter a number to get sum of n natural numbers: ");

*int* n **=** sc.nextInt();

*int* sum **=** 0;

**for** (*int* i **=** 1; i **<=** n; i**++**) {

            sum **+=** i;

        }

        System.out.println("The sum of the first " **+** n **+** " natural numbers is: " **+** sum);

        sc.close();

    }

}

# **Factorial (With Exception handling for negative numbers):**

import java.util.Scanner;

public class factorial {

    public static int fact(int n) {

        if (n == 0 || n == 1) {

            return 1;

        } else {

            return n \* fact(n - 1);

        }

    }

    public static void main(String[] args) {

        Scanner sc = new Scanner(System.in);

        System.out.print("Enter a number to calculate its factorial: ");

        try {

            int number = sc.nextInt();

            if (number < 0) {

                throw new IllegalArgumentException("Factorial is not defined for negative numbers.");

            }

            int result = fact(number);

            System.out.println("The factorial of " + number + " is: " + result);

        } catch (IllegalArgumentException e) {

            System.out.println("Error: " + e.getMessage());

        } catch (Exception e) {

            System.out.println("Invalid input. Please enter a valid integer.");

        } finally {

            sc.close();

        }

    }

}

# **Tasks**

# **Task 1**

1. take 2 variables a and b (int)
2. Create sum variable
3. Create sub variable
4. Print sum
5. Print sub

# **Program**

**import** **java.util.Scanner**;

**public** **class** task1 {

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

*Scanner* sc **=** **new** Scanner(System.in);

*int* a, b, sum, sub;

System.out.println("Enter two numbers:");

a **=** sc.nextInt();

b **=** sc.nextInt();

sum **=** a **+** b;

sub **=** a **-** b;

System.out.println("Sum: " **+** sum);

System.out.println("Subtraction: " **+** sub);

sc.close();

}

}

**Task 2**

1. a. create buttons
2. b. if button1 hello
3. c. button2 namaste
4. d. button3 good morning
5. e. else bonjour

# **Program**

**import** **java.util.Scanner**;

**public** **class** task2 {

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

*Scanner* sc **=** **new** Scanner(System.in);

        System.out.print("Enter the button number(1 - 3): ");

*int* button **=** sc.nextInt();

**if** (button **==** 1) {

            System.out.println("Hello");

        } **else** **if** (button **==** 2) {

            System.out.println("Namaste");

        } **else** **if** (button **==** 3) {

            System.out.println("Good Morning");

        } **else** {

            System.out.println("Bonjour");

        }

        sc.close();

    }

}

# **Task 3**

Write table of 2 by using for loop

# **Program**

public class table {

    public static void main(String[] args) {

        int t=2;

        for (int k=1;k<=10;k++){

            System.out.println(t+"\*"+k+"="+(t\*k));

        }

    }

}

# **Task 4**

a. take 5 numbers from user

b. print even number

c. print odd numbers

# **Program**

**import** **java.util.Scanner**;

**public** **class** eveodd {

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

*Scanner* sc **=** **new** Scanner(System.in);

*int* nums[] **=** **new** *int*[5];

        System.out.println("Enter 5 numbers: ");

**for** (*int* i **=** 0; i **<** 5; i**++**) {

            System.out.print("Number " **+** (i **+** 1) **+** ": ");

            nums[i] **=** sc.nextInt();

        }

        System.out.print("Even numbers: ");

**for** (*int* i **=** 0; i **<** 5; i**++**) {

**if** (nums[i] **%** 2 **==** 0) {

                System.out.print(nums[i] **+** "\t");

            }

        }

        System.out.println();

        System.out.print("Odd numbers: ");

**for** (*int* i **=** 0; i **<** 5; i**++**) {

**if** (nums[i] **%** 2 **!=** 0) {

                System.out.print(nums[i] **+** "\t");

            }

        }

  sc.close();

    }

}

**Task 5**

Make function to add two numbers and return it

***Program***

**import** **java.util.Scanner**;

**public** **class** task5 {

**public** *int* add() {

*Scanner* sc **=** **new** Scanner(System.in);

*int* a **=** sc.nextInt();

*int* b **=** sc.nextInt();

        sc.close();

**return** a **+** b;

    }

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

        task5 obj **=** **new** task5();

*int* result **=** obj.add();

        System.out.println("The sum is: " **+** result);

    }

}

# **Task 6**

a. function for counting digits in a number

b. function to check if string is palindrome

c. function to reverse a number

***Program***

**import** **java.util.Scanner**;

**public** **class** task6 {

**public** *void* countDigits () {

*Scanner* sc **=** **new** Scanner(System.in);

        System.out.print("Enter a number: ");

*int* n **=** sc.nextInt();

*int* count **=** 0;

**while** (n **>** 0) {

            n **/=** 10;

            count**++**;

        }

        System.out.println("Number of digits: " **+** count);

        sc.close();

    }

**public** *void* palindrome() {

*Scanner* sc **=** **new** Scanner(System.in);

        System.out.print("Enter a string: ");

*String* str **=** sc.next();

*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.");

        }

        sc.close();

    }

**public** *void* reverseNumber() {

*Scanner* sc **=** **new** Scanner(System.in);

        System.out.print("Enter a number: ");

*int* n **=** sc.nextInt();

*int* reversed **=** 0;

**while** (n **!=** 0) {

*int* digit **=** n **%** 10;

            reversed **=** reversed **\*** 10 **+** digit;

            n **/=** 10;

        }

        System.out.println("Reversed number: " **+** reversed);

        sc.close();

    }

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

        task6 t **=** **new** task6();

*Scanner* sc **=** **new** Scanner(System.in);

        System.out.println("Choose an option:");

        System.out.println("1. Count digits in a number");

        System.out.println("2. Check if a string is a palindrome");

*int* choice **=** sc.nextInt();

**switch** (choice) {

**case** 1**:**

                t.countDigits();

**break**;

**case** 2**:**

                t.palindrome();

**break**;

**case** 3**:**

                t.reverseNumber();

**break**;

**default:**

                System.out.println("Invalid choice.");

        }

        sc.close();

    }

}

Prime Number:

**import** **java.util.Scanner**;

**public** **class** findprime {

**public** *void* isprime(*int* *n*) {

*int* i, m **=** n **/** 2, flag **=** 0;

**if** (n **==** 0 **||** n **==** 1) {

            System.out.println(n **+** " is not a prime number.");

        } **else** {

**for** (i **=** 2; i **<=** m; i**++**) {

**if** (n **%** i **==** 0) {

                    System.out.println(n **+** " is not a prime number.");

                    flag **=** 1;

**break**;

                }

            }

**if** (flag **==** 0) {

                System.out.println(n **+** " is a prime number.");

            }

        }

    }

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

*Scanner* sc **=** **new** Scanner(System.in);

        System.out.print("Enter a number to check if it is prime: ");

*int* n **=** sc.nextInt();

        findprime fp **=** **new** findprime();

        fp.isprime(n);

        sc.close();

    }

}