TASK 2: Variables, Data Types & Console Input Application.

Variables :- A variable in Java is a named memory location used to store data values that can be changed during program execution.
Variable = name + data type + value

Why do we need variables?

Variables are used to:

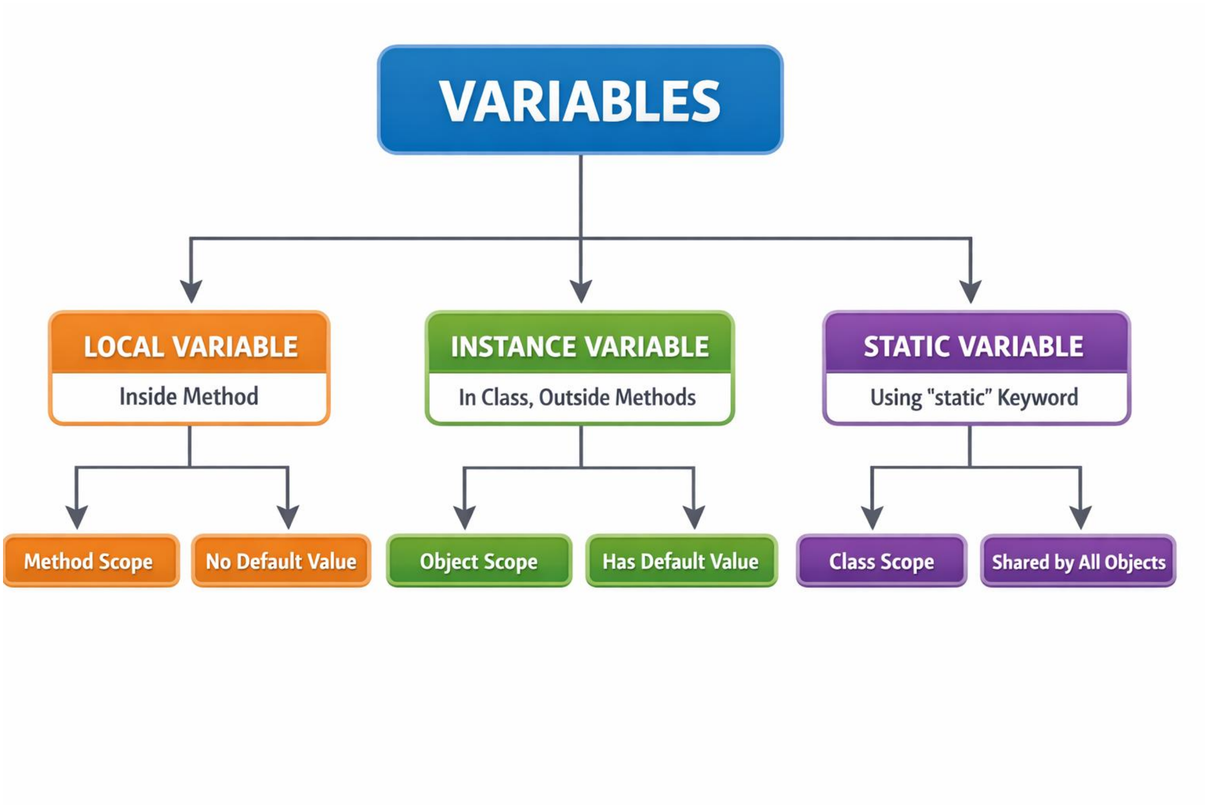
- Store user input
- Store calculation results
- Hold program state
- Reuse data efficiently

Without variables, programs cannot perform meaningful operations.

Syntax of Variable Declaration:- dataType variableName = value;

- Example:- int age = 20;
- int → data type
- age → variable name
- 20 → value

Types of Variables in Java:-



Local Variable:- A local variable is declared inside a method, constructor, or block and is accessible only within that block.

Characteristics:

- No default value
- Must be initialized before use
- Stored in stack memory
- Short lifetime

Example Code:

```
class Example
{
  public void show()
{
    int x = 10;  // local variable
    System.out.println(x);
  }
}
```

Instance Variable:-An instance variable is declared inside a class but outside any method.
Each object gets its own copy of instance variables.

Characteristics:

- Has default value
- Stored in heap memory
- Lifetime = object lifetime
- Accessed using object

Example Code:

```
class Student {
   int age; // instance variable


   public void display() {
      System.out.println(age);
   }


   public static void main(String[] args) {
    Student s1 = new Student();
      s1.display(); // prints 0 (default value)
   }
}
```

Static Variable (Class Variable):-A static variable is declared using the static keyword.
It is shared among all objects of the class.

Characteristics:

- Single copy
- Memory efficient
- Stored in method area
- Accessed using class name

Example Code:

```
class Company {
   static String companyName = "Tech Corp";


   public static void main(String[] args) {
        System.out.println(Company.companyName);
    }
}
```

What is a Data Type in Java?

A data type specifies:

- What kind of data a variable can store
- How much memory it occupies
- What operations can be performed on it

Without data types, Java cannot manage memory efficiently.

Classification of Data Types in Java

1.)Primitive Data Types
2.) Non-Primitive Data Types

Example Code (Primitive Types)

```
class PrimitiveDemo
{
    public static void main(String[] args) {
        int age = 20;
        double salary = 25000.50;
        char grade = 'A';
        boolean isActive = true;

        System.out.println(age);
        System.out.println(salary);
        System.out.println(grade);
        System.out.println(isActive);
    }
}
```

Non-Primitive Data Types:-

- String

- Array
- Class
- Interface
- Object

String Example

```
class StringDemo
{
  public static void main(String[] args) {
    String name = "Akash";
    System.out.println(name);
  }
}
```

Array Example

```
class ArrayDemo
{
  public static void main(String[] args) {
    int[] marks = {85, 90, 88};
    System.out.println(marks[0]);
  }
}
```

What is Type Casting?

Converting one data type into another.

- Implicit: small → large (int → double)
- Explicit: large → small (double → int)

What is a Console Input Application?

A console input application is a program that:

- Takes input from the keyboard (console)
- Processes the data
- Displays output in the console window
- canner Class (Core of Console Input)

- Step 1:
- Import Scanner

import java.util.Scanner;

Step 2:

Create Scanner Object

Scanner sc = new Scanner(System.in);

Step 3:

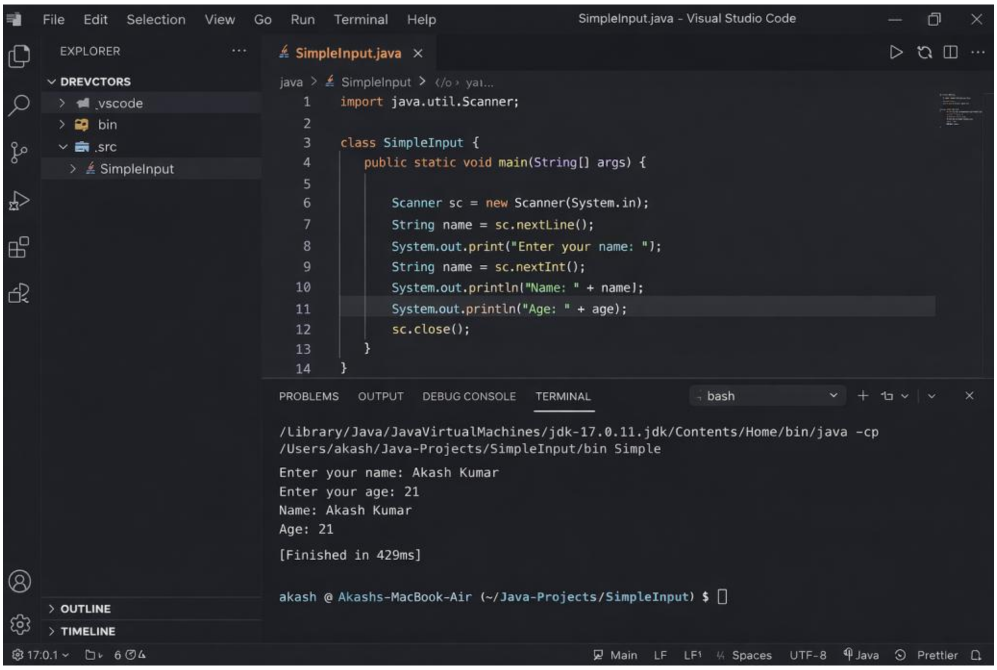
Read Input

int a = sc.nextInt();

double b = sc.nextDouble();

String name = sc.next();

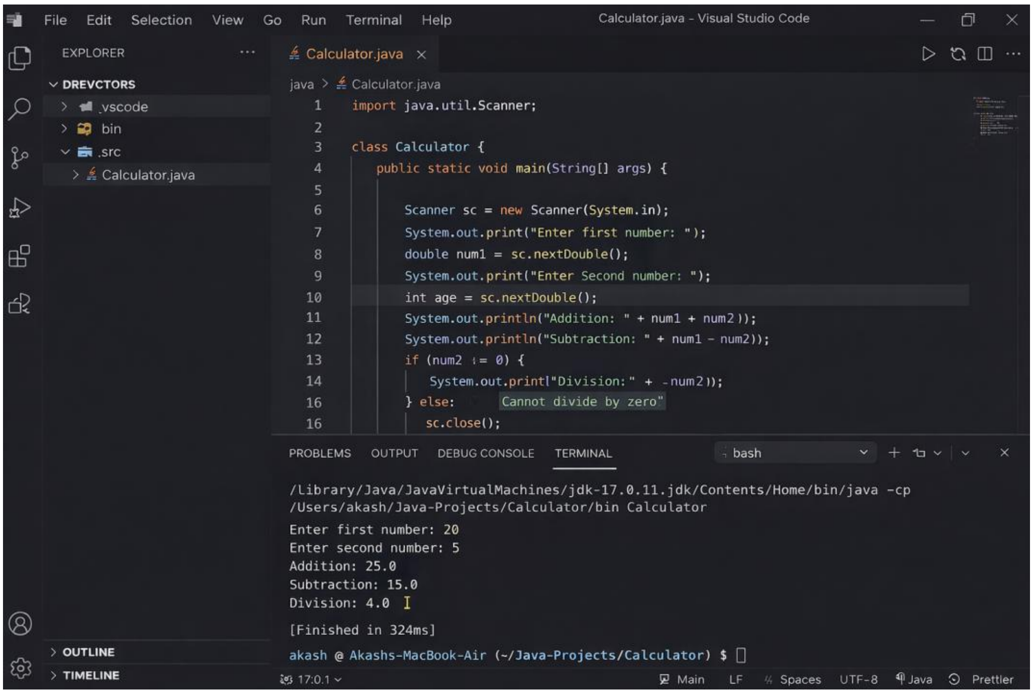
Example :- Simple Console Input Program



```java
import java.util.Scanner;

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

        Scanner sc = new Scanner(System.in);
        String name = sc.nextLine();
        System.out.print("Enter your name: ");
        String name = sc.nextInt();
        System.out.println("Name: " + name);
        System.out.println("Age: " + age);
        sc.close();
    }
}
```

```
/Library/Java/JavaVirtualMachines/jdk-17.0.11.jdk/Contents/Home/bin/java -cp
/Users/akash/Java-Projects/SimpleInput/bin Simple
Enter your name: Akash Kumar
Enter your age: 21
Name: Akash Kumar
Age: 21
[Finished in 429ms]

akash @ Akashs-MacBook-Air (~/Java-Projects/SimpleInput) $
```

Example : Console-Based Calculator



```
import java.util.Scanner;

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

        Scanner sc = new Scanner(System.in);
        System.out.print("Enter first number: ");
        double num1 = sc.nextDouble();
        System.out.print("Enter Second number: ");
        int age = sc.nextDouble();
        System.out.println("Addition: " + num1 + num2 ));
        System.out.println("Subtraction: " + num1 - num2));
        if (num2 != 0) {
            System.out.printl"Division:" + -num2));
        } else:     Cannot divide by zero"
            sc.close();
```

```
/Library/Java/JavaVirtualMachines/jdk-17.0.11.jdk/Contents/Home/bin/java -cp
/Users/akash/Java-Projects/Calculator/bin Calculator
Enter first number: 20
Enter second number: 5
Addition: 25.0
Subtraction: 15.0
Division: 4.0

[Finished in 324ms]
akash @ Akashs-MacBook-Air (~/Java-Projects/Calculator) $
```