

Java Data Types and Variables

In Java, variables are containers used to store data. Each variable has a data type that determines the kind of values it can hold. Java is a statically typed language, meaning variables must be declared with a type before use. Data types are divided into two categories: **Primitive Data Types** and **Non-Primitive Data Types**.

1. Primitive Data Types

Java has 8 primitive data types. These are predefined by the language and named by a keyword.

byte - 8-bit integer. Range: -128 to 127.

short - 16-bit integer. Range: -32,768 to 32,767.

int - 32-bit integer. Commonly used for whole numbers.

long - 64-bit integer. Used when int is not large enough.

float - 32-bit floating point. Used for decimal values.

double - 64-bit floating point. More precision than float.

char - 16-bit Unicode character. Example: 'A'.

boolean - Represents true or false values.

```
public class PrimitiveExample {
    public static void main(String[] args) {
        byte b = 100;
        short s = 1000;
        int i = 100000;
        long l = 1000000000000L;
        float f = 5.75f;
        double d = 19.99d;
        char c = 'A';
        boolean bool = true;

        System.out.println("Byte value: " + b);
        System.out.println("Short value: " + s);
        System.out.println("Int value: " + i);
        System.out.println("Long value: " + l);
        System.out.println("Float value: " + f);
        System.out.println("Double value: " + d);
        System.out.println("Char value: " + c);
        System.out.println("Boolean value: " + bool);
    }
}
```

2. Non-Primitive Data Types

These are not defined by the Java language but are created by programmers. They include classes, arrays, and strings.

```
public class NonPrimitiveExample {
    public static void main(String[] args) {
        // String (non-primitive)
        String name = "Java Programming";

        // Array (non-primitive)
        int[] numbers = {10, 20, 30, 40, 50};

        // Object of a class (non-primitive)
        Student student = new Student("Ashim", 21);

        System.out.println("String: " + name);
        System.out.println("Array element: " + numbers[2]);
        student.display();
    }
}
```

```

    }
}

class Student {
    String name;
    int age;

    Student(String name, int age) {
        this.name = name;
        this.age = age;
    }

    void display() {
        System.out.println("Student: " + name + " Age: " + age);
    }
}

```

Summary:

- Variables are storage containers for data in Java.
- Data types ensure type safety and memory efficiency.
- Primitive types are basic (byte, short, int, long, float, double, char, boolean).
- Non-primitive types include Strings, Arrays, and user-defined Classes.