02-DataTypes

In Java, data is stored in variables, which can have different data types.

Data Types

Data types in Java are divided into two main categories:

1. **Primitive Data Types**
2. **Non-Primitive Data Types** (to be discussed in upcoming chapters)

Primitive data types: Primitive data types in Java are the foundational building blocks of data manipulation. Unlike more complex data structures, they represent simple values such as a single number or character. Java offers eight primitive types: byte, short, int, long, float, double, char, and boolean and it can be further classified into the following sub-categories:

1. **Integer types**
2. **Floating-point types**
3. **Character type**
4. **Boolean type**

Detailed Breakdown of Primitive Data Types

1. Integer

The integer data types are used for storing whole numbers, which include natural numbers, zeros, and negative numbers. Different integer data types are available based on the range and size required:

- **byte**: 1 byte (8 bits), range: -128 to 127
- **short**: 2 bytes (16 bits), range: -32,768 to 32,767
- **int**: 4 bytes (32 bits), range: -2^31 to 2^31 - 1
- **long**: 8 bytes (64 bits), range: -2^63 to 2^63 - 1 (use an 'L' suffix to specify a long literal, e.g., 123456789L)

2. Character

The `char` type is used to store a single character, such as a letter, digit, or symbol, enclosed in single quotes (e.g., `'A'`). It has a size of 2 bytes (16 bits)

because Java uses the Unicode standard, which accommodates a broader range of characters compared to ASCII.

3. Boolean
The `boolean` type represents a truth value and can hold only two possible values: `true` or `false`. It is primarily used in conditional statements. Unlike some other programming languages that might represent boolean values with 0 and 1, Java strictly uses the keywords `true` and `false`. This means that in Java, you cannot use integers to represent boolean values—only `true` or `false` are valid.

In Java, the `boolean` data type is unique compared to languages that might allow numerical representations (like 0 for false and 1 for true). Java does not support 0 and 1 as boolean values. The boolean data type strictly allows only two values:

- `true`
- `false`

This design decision helps prevent logical errors and ensures that conditions in your code are clear and unambiguous.

4. Float and Double
These data types are used for storing decimal or floating-point numbers:

- **float**: 4 bytes, single-precision, range approximately ±3.40282347E+38F (use 'f' suffix, e.g., 3.14f)
- **double**: 8 bytes, double-precision, range approximately ±1.79769313486231570E+308 (default for decimal numbers)

Sizes and Ranges of Primitive Data Types

Data Type	Size	Range	Example
byte	1 byte	-128 to 127	byte b = 100;
short	2 bytes	-32,768 to 32,767	short s = 3000;
int	4 bytes	-2^31 to 2^31 - 1	int i = 123489;
long	8 bytes	-2^63 to 2^63 - 1	long l = 123456789L;

Data Type	Size	Range	Example
float	4 bytes	±3.40282347E+38F	float f = 3.14f;
double	8 bytes	±1.79769313486231570E+308	double d = 3.14159;
char	2 bytes	0 to 65,535 (Unicode)	char c = 'A';
boolean	1 bit	true or false	boolean flag = true;

- **Code:**

```
class hello{

    public static void main(String[] args) {
        int num1=8;

        byte by=127;

        short sh=558;

        long l= 5854l;

        float f=5.8f;

        double d=5.8;

        char c='k';

        boolean b=  true;

        }
}
```

- This Java program demonstrates the declaration and initialization of various primitive data types, including `int`, `byte`, `short`, `long`, `float`, `double`, `char`, and `boolean`. Each variable is assigned a specific value to illustrate how these data types can be used in Java.