

Variables & Data Types

What is a Variable?

In real life, we store things in containers.

For example:

- Water in a bottle
- Books in a bag

In programming, **variables are containers used to store data.**

A variable holds a value so that the program can use it later.

Why Variables are Needed

Programs work with data.

Examples:

- Age of a user
- Price of a product
- Name of a student

To store this data in memory, we use variables.

Without variables, programs cannot remember values.

Simple Variable Example

`int a = 10;`

Let us understand this line clearly.

- `int` → data type
- `a` → variable name
- `=` → assignment operator
- `10` → value stored in the variable

This means:

A memory space named **a** stores the value **10**.

What is a Data Type?

A data type tells Java:

- What kind of data will be stored
- How much memory is required

Java is a **strongly typed language**.

This means:

- Every variable must have a data type
 - Data type is decided before storing the value
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Primitive Data Types

Primitive data types store **simple values**.

Common primitive data types:

- int → stores whole numbers
- double → stores decimal numbers
- char → stores a single character
- boolean → stores true or false

Example:

```
int age = 25;  
double price = 99.50;  
char grade = 'A';  
boolean isPassed = true;
```

Non-Primitive Data Types

Non-primitive data types store **complex data**.

They usually store:

- Multiple values
- Text
- Objects

Common non-primitive types:

- String
- Arrays
- Classes

Example:

```
String name = "Java";
```

Here:

- String → data type
- name → variable

- "Java" → value
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Difference Between Primitive and Non-Primitive

Primitive:

- Stores simple values
- Fixed size
- Faster

Non-Primitive:

- Stores complex data
 - Can store multiple values
 - More flexible
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Variable Declaration and Initialization

Declaration

Creating a variable without value:

```
int x;
```

Initialization

Assigning value to a variable:

```
x = 5;
```

Declaration + Initialization

```
int x = 5;
```

Types of Variables in Java

Java has three main types of variables.

1. Local Variables

- Declared inside a method
- Used only inside that method

Example:

```
public static void main(String[] args) {  
    int num = 10;  
}
```

Here, num is a local variable.

2. Instance Variables

- Declared inside a class
- Outside any method
- Each object gets its own copy

Example:

```
class Student {  
    int age;  
}
```

3. Static Variables

- Declared using static keyword
- Shared by all objects

Example:

```
class College {  
    static String name = "ABC College";  
}
```

Variable Naming Rules

- Must start with a letter
- Cannot start with a number
- No spaces allowed
- Should be meaningful

Good examples:

- age
- totalMarks

Bad examples:

- lage
 - total marks
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Remember This

Variables store data.

Data types decide **what kind of data** can be stored.

If this is clear, half of Java becomes easy.