

Data Types

What kind of box holds your data? ■

■ What You Will Learn

- The 4 most-used primitive types: int, double, char, boolean
- What a String is and why it's special
- Type casting — converting one type to another
- When to use which type

■ Intuition First

Every piece of data needs a **container**. Data types are like different shaped boxes — a number box, a letter box, a yes/no box. You pick the right box for the right job.

■ Think Like This

You wouldn't store soup in a paper bag. You pick the right container for the right data. int for whole numbers, double for decimals, char for a single letter, boolean for true/false.

■ Visual: The Type Zoo

■	Type	■	What it holds	■	Example	■
■	int	■	Whole numbers	■	42, -7, 0	■
■	double	■	Decimal numbers	■	3.14, -0.5	■
■	char	■	Single character	■	'A', '9'	■
■	boolean	■	true / false only	■	true, false	■
■	String	■	Text (many chars)	■	"Hello!"	■

■■ How It Works

1

Declare the type

Tell Java what kind of box you need. int age;

2	Give it a name The name is your label on the box. <code>int studentAge;</code>
3	Assign a value Put something inside it. <code>studentAge = 20;</code>
4	Or do it in one line <code>int studentAge = 20;</code> — declare + assign together.
5	Use it anywhere Print it, do math with it, compare it — it's yours now.

■ Code Implementation (Java)

```
public class DataTypes {  
    public static void main(String[] args) {  
        int score      = 95;          // whole number  
        double price   = 49.99;      // decimal  
        char grade     = 'A';        // single letter (use single quotes!)  
        boolean isPassed = true;     // yes/no  
        String name    = "Rahul";    // text (use double quotes!)  
        System.out.println("Name: " + name);  
        System.out.println("Score: " + score);  
        System.out.println("Price: " + price);  
        System.out.println("Grade: " + grade);  
        System.out.println("Passed:" + isPassed);  
        // Type casting: int to double  
        double newScore = (double) score; // 95 → 95.0  
    }  
}
```

■■ Time & Space Complexity

■ TIME COMPLEXITY

O(1)

■ SPACE COMPLEXITY

O(1)

Storing and reading a single variable is always instant. No loops involved.

■■ Common Mistakes

■■ **char uses single quotes, String uses double quotes**

`char c = 'A';` is correct. `char c = "A";` will cause a compile error!

■■ int can't hold decimals

int x = 3.14; will throw an error. Use double x = 3.14; instead.

■ Practice Problems

#	Problem	Difficulty
1	Declare variables for a student: name, age, marks, passed(boolean)	Easy
2	Calculate area of a circle using double and print it	Easy
3	Cast an int to double and show the difference in print	Easy
4	Store a sentence in String and print its length	Medium
5	Swap values of two int variables without a third variable	Medium

■ Quick Revision Box

- ✓ int → whole numbers only
- ✓ double → decimals (more precise than float)
- ✓ char → single character in single quotes: 'A'
- ✓ boolean → only true or false
- ✓ String → text in double quotes (not a primitive!)
- ✓ Type casting: (targetType) value

■ Visual Thinking

■ Imagine It Like This

Think of RAM as a row of labelled boxes on a shelf. Each data type is a different sized box. A boolean is a tiny sticky note (just T or F). An int is a medium box. A String is a long tube. Animation idea: Show boxes appearing on a shelf as each variable is declared.