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Hello class, let's dive into one of the most fundamental topics in Java: **data types**. Understanding data types is crucial because they tell the computer what kind of data you're working with and how to store it efficiently.

What is a Data Type?

A **data type** specifies the size and type of values a variable can hold. It tells the compiler how to interpret the data stored in a variable's memory location.

For example, a variable of type int can store whole numbers, while a String variable stores a sequence of characters.

Categorization of Data Types

In Java, data types are divided into two main categories:

1. **Primitive Data Types:** These are the most basic data types and are predefined by Java. They hold simple, single values and do not have any additional methods. There are eight primitive types.
2. **Non-Primitive Data Types:** These are also known as **reference types**. They are not predefined by Java and are created by the programmer. They refer to objects and hold the memory address of the object, not the value itself.

Non-Primitive Data Types in Java

Non-primitive data types are created by the programmer and refer to objects. They include:

- **String**: A sequence of characters. String is one of the most commonly used non-primitive types.
- **Array**: A collection of elements of the same data type.
- **Class**: The blueprint for creating objects (as we discussed previously).
- **Interface**: A blueprint of a class.

Real-Time Example:

Imagine you're building a system for an online store.

- An **int** would store the quantity of a product.
- A **double** would store the price of the product.
- A **String** would store the product's name and description.
- A **Product class** (a non-primitive type) would bundle all of these together into a single, organized unit.

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Primitive Data Types in Java

Java has eight primitive data types. They are categorized into four groups:

Data Type	Size (in bytes)	Default Value	Real-Time Example
byte	1	0	Storing small numerical data, like a person's age.
short	2	0	Storing a small number, like a product ID.
int	4	0	Storing whole numbers, like the count of items in a cart or a year.
long	8	0L	Storing large numbers, like a bank account balance or population count.
float	4	0.0f	Storing numbers with decimals, like a student's grade or a price (when precision isn't critical).
double	8	0.0d	Storing numbers with high precision, like scientific calculations or currency values.
char	2	'\u0000'	Storing a single character, like 'A' or '$'.
boolean	1	false	Storing true/false values, like a login status or a light switch state.

Important Note: The default value is what a variable will be initialized to if it is not explicitly assigned a value by the programmer.

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EXAMPLE:

```
public class PrimitiveExample {
    public static void main(String[] args) {
        // Example of an integer
        int studentCount = 30;

        // Example of a double
        double productPrice = 49.99;

        // Example of a boolean
        boolean isLoggedIn = true;

        // Example of a character
        char userInitial = 'J';

        System.out.println("Students: " + studentCount);
        System.out.println("Price: $" + productPrice);
        System.out.println("User Logged In: " + isLoggedIn);
        System.out.println("User Initial: " + userInitial);
    }
}
```

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```
public class NonPrimitiveExample {
   public static void main(String[] args) {
      // Example of a String
      String productName = "Java Course Book";

      // Example of an array
      int[] studentGrades = {95, 88, 76, 92};

      // Example of a custom Class (assuming a 'Student' class exists)
      // Student student1 = new Student("Alice", 25);

      System.out.println("Product Name: " + productName);
      System.out.println("First Grade: " + studentGrades[0]);
   }
}
```

Common Interview Questions

1. **What is the difference between primitive and non-primitive data types in Java?**
    - **Primitive** types are predefined, hold a single value, and are stored directly in memory.
    - **Non-primitive** types (or reference types) are created by the programmer, hold references to objects, and are stored on the heap.
2. **Can you name all eight primitive data types?**
    - byte, short, int, long, float, double, char, boolean.
3. **What is the default value of an int and a String?**
    - The default value for a primitive int is 0.
    - The default value for a non-primitive String is null.
4. **How can you store a very large number that exceeds the range of an int?**
    - You would use the long data type.
5. **Explain the difference between float and double.**
    - float is a single-precision floating-point number, taking up 4 bytes.
    - double is a double-precision floating-point number, taking up 8 bytes, and is generally preferred for more accurate calculations.