# Java Programming Assignment

## Section 1: Java Data Types

**1. What are the different primitive data types available in Java?**

Primitive data types in Java are the fundamental building blocks used to store simple values directly in memory. They differ in size, range, and the kind of data they hold. Below are the main ones:  
  
• byte – Smallest integer type, ideal for saving memory in large arrays (1 byte; range: -128 to 127). Example: byte count = 12;  
• short – Stores medium-sized integers where memory conservation matters (2 bytes; range: -32,768 to 32,767). Example: short temp = 2800;  
• int – Default integer type for most operations (4 bytes; range: approx. ±2 billion). Example: int score = 95000;  
• long – Used for very large integer values (8 bytes; range: approx. ±9 quintillion). Example: long worldPopulation = 7800000000L;  
• float – Single-precision decimal numbers (4 bytes; ~7 decimal digits). Example: float rating = 4.75f;  
• double – Double-precision decimal numbers (8 bytes; ~15 decimal digits). Example: double distance = 9876.54321;  
• char – Stores a single Unicode character (2 bytes). Example: char symbol = 'Z';  
• boolean – Holds true/false values (1 byte). Example: boolean isActive = false;

**2. Explain the difference between primitive and non-primitive data types in Java.**

Primitive types are built-in and store data directly (e.g., int, float, char, boolean). They have fixed sizes and no associated methods. In contrast, non-primitive (reference) types store memory addresses pointing to objects, which may contain fields and methods (e.g., String, Arrays, Classes). Primitive data is stored on the stack, while non-primitive objects are typically in heap memory.

**3. Write a Java program that demonstrates the use of all primitive data types.**

Example Program:  
public class PrimitiveDemo {  
 public static void main(String[] args) {  
 byte b = 42;  
 short s = 32000;  
 int i = 123456;  
 long l = 9999999999L;  
 float f = 2.5f;  
 double d = 123.456;  
 char ch = 'K';  
 boolean flag = true;  
  
 System.out.println("byte: " + b);  
 System.out.println("short: " + s);  
 System.out.println("int: " + i);  
 System.out.println("long: " + l);  
 System.out.println("float: " + f);  
 System.out.println("double: " + d);  
 System.out.println("char: " + ch);  
 System.out.println("boolean: " + flag);  
 }  
}

**4. What is type casting? Provide an example of implicit and explicit casting in Java.**

Type casting is converting a variable from one type to another. Implicit (widening) happens automatically when moving to a larger compatible type. Explicit (narrowing) requires manual conversion using a cast operator.

Example (Implicit):  
int num = 50;  
double dbl = num;  
System.out.println(dbl);

Example (Explicit):  
double value = 9.78;  
int intValue = (int) value;  
System.out.println(intValue);

**5. What is the default value of each primitive data type in Java?**

byte → 0  
short → 0  
int → 0  
long → 0L  
float → 0.0f  
double → 0.0d  
char → '\u0000' (null character)  
boolean → false