UNIVERSITY OF CALGARY

CPSC 319
Data Structures, Algorithms, and Their Applications

Winter 2024

Java

- Java is designed as an object-oriented programming language.
- Object-oriented programming involves organizing code into objects, which are instances of classes.
- Objects in Java communicate through method calls, allowing them to collaborate and work together seamlessly.

Basic Terminologies in Java

- **Class:** The class is a blueprint (plan) of the instance of a class (object). It can be defined as a logical template that share common properties and methods.
  - Example: Blueprint of the house is class.
- **Object:** The object is an instance of a class. It is an entity that has behavior and state.
  - Example: Dog, Cat, Monkey etc. are the object of “Animal” class.
- **Method:** The behavior of an object is the method.
  - Example: Barking of the dogs.
- **Fields:** Every object has its own set of instance variables. The state of an object is generally created by the values that are assigned to these fields.
  - Example: Breed, color, and age of a dog.

HelloWorld.java

```java
// This is the declaration of the HelloWorld class.
public class HelloWorld {
    // The main method is the entry point of the Java program.
    public static void main(String[] args){
        // This line prints the message "Hello World!" to the console.
        System.out.println("Hello World!");
    }
}

```

Primitive Data Types

- Basic building blocks of data in Java.
- Directly manipulate values.
- Fixed size.
- Stored in memory for quick access.
- boolean, byte, char, short, int, long, float, double
- Ideal for simple, atomic values.

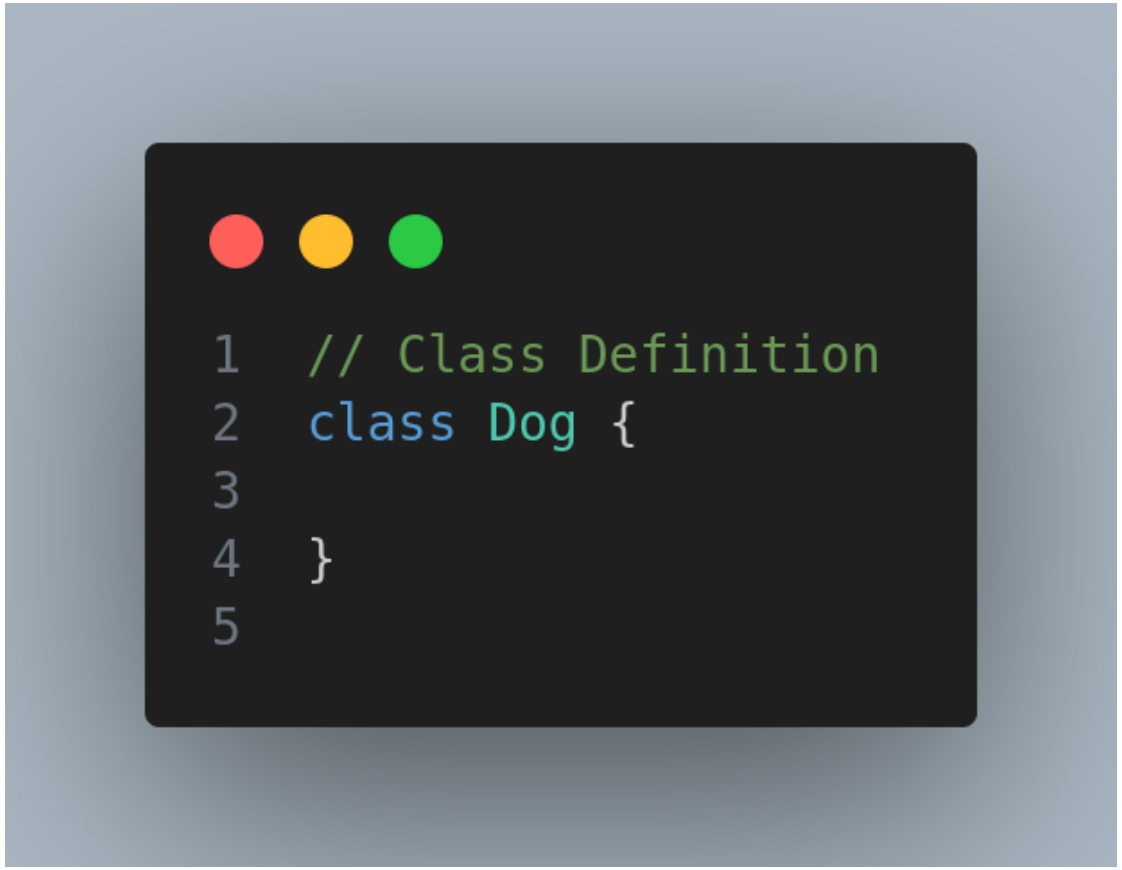
Primitive Data Types

Data Type	Size	Description
byte	1 byte	Stores whole numbers from -128 to 127
short	2 bytes	Stores whole numbers from -32,768 to 32,767
int	4 bytes	Stores whole numbers from -2,147,483,648 to 2,147,483,647
long	8 bytes	Stores whole numbers from -9,223,372,036,854,775,808 to 9,223,372,036,854,775,807
float	4 bytes	Stores fractional numbers. Sufficient for storing 6 to 7 decimal digits
double	8 bytes	Stores fractional numbers. Sufficient for storing 15 decimal digits
boolean	1 bit	Stores true or false values
char	2 bytes	Stores a single character/letter or ASCII values

Non-Primitive Data Types

- Derived from primitive types and include more complex structures.
- Can have methods and perform operations.
- Dynamic size.
- Stored by reference.
- Arrays, Strings, Objects, Classes
- Suited for more complex and structured data.

Defining a Class



Defining a Class

```java
// Class Definition
class Dog {
    // Class Member: Field
    int age;

    // Class Member: Method
    void bark(){
        System.out.println("Woof!");
    }
}

```

Defining a Class

```java
// Class Definition
class Dog {
    // Class Member: Field
    int age;

    // Default Constructor
    Dog(){

    }

    // Class Member: Method
    void bark(){
        System.out.println("Woof!");
    }
}

```

Constructor

- A constructor in Java is a special method within a class that is automatically invoked when an object of that class is created.

- The primary purpose of a constructor is to initialize the state of an object, ensuring that it starts with a valid and known state.

Defining a Class

```java
// Class Definition
class Dog {
    // Class Member: Field
    int age;

    // Default Constructor
    Dog(){

    }

    // Custom Constructor
    Dog(int age){
        this.age = age;
    }

    // Class Member: Method
    void bark(){
        System.out.println("Woof!");
    }
}

```

Arrays

- An array in Java is a data structure that allows you to store multiple values of the same data type under a single name.

- Arrays are objects, and their elements are accessed using an index.