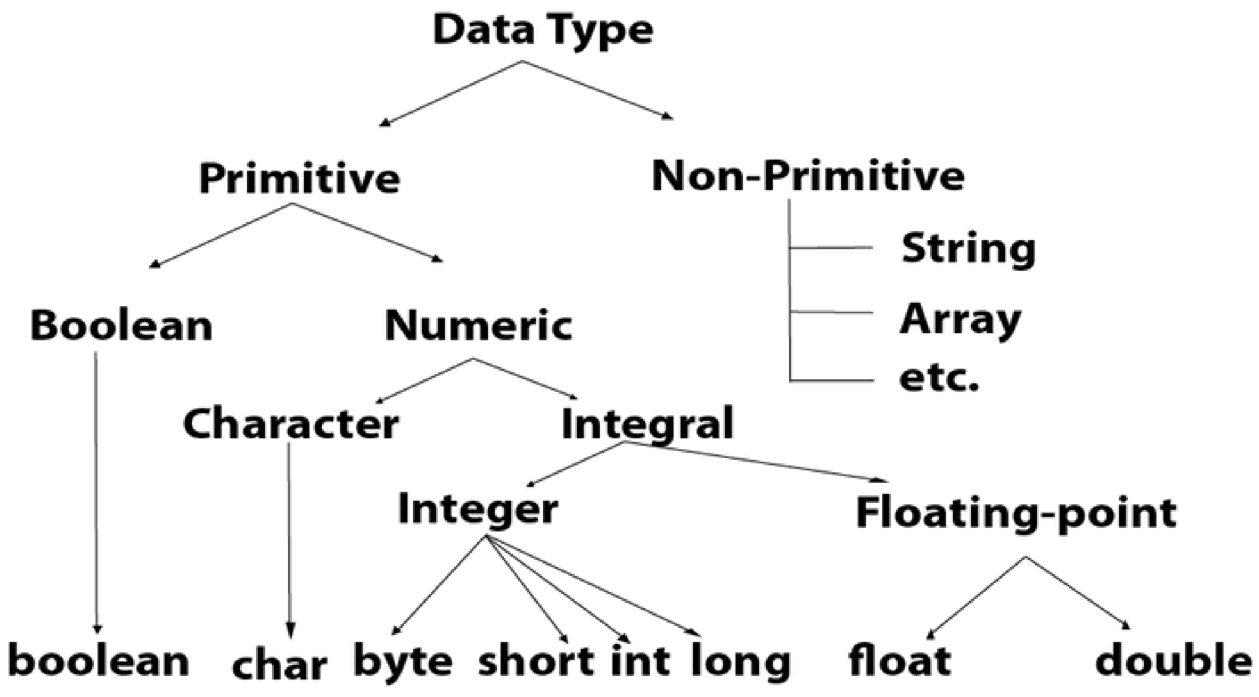
Java Data Types

As explained in the previous chapter, a variable in Java must be a specified data type:
Data types are divided into two groups:

- **Primitive data types** - includes byte, short, int, long, float, double, boolean and char
- **Non-primitive data types** - such as String, Arrays and Classes (you will learn more about these in a later chapter)



Primitive Data Types

A primitive data type specifies the size and type of variable values, and it has no additional methods.
There are eight primitive data types in Java:

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

Numbers

• Primitive number types are divided into two groups:

• **Integer types** stores whole numbers, positive or negative (such as 123 or -456), without decimals. Valid types are byte, short, int and long. Which type you should use, depends on the numeric value.
• **Floating point types** represents numbers with a fractional part, containing one or more decimals. There are two types: float and double.
• Even though there are many numeric types in Java, the most used for numbers are int (for whole numbers) and double (for floating point numbers). However, we will describe them all as you continue to read.

Integer Types

Byte

• The byte data type can store whole numbers from -128 to 127. This can be used instead of int or other integer types to save memory when you are certain that the value will be within -128 and 127:

```
byte myNum = 100;
System.out.println(myNum);
```

Short

• The short data type can store whole numbers from -32768 to 32767:

```
short myNum = 5000;
System.out.println(myNum);
```

Int

• The int data type can store whole numbers from -2147483648 to 2147483647. In general, and in our tutorial, the int data type is the preferred data type when we create variables with a numeric value.

```
int myNum = 100000;
System.out.println(myNum);
```

Long

• The long data type can store whole numbers from -9223372036854775808 to 9223372036854775807. This is used when int is not large enough to store the value. Note that you should end the value with an "L":

```
long myNum = 15000000000L;
System.out.println(myNum);
```

Floating Point Types

• You should use a floating point type whenever you need a number with a decimal, such as 9.99 or 3.14515.

Float

• The float data type can store fractional numbers from 3.4e−038 to 3.4e+038. Note that you should end the value with an "f":

```
float myNum = 5.75f;
System.out.println(myNum);
```

Double

• The double data type can store fractional numbers from 1.7e−308 to 1.7e+308. Note that you should end the value with a "d":

```
double myNum = 19.99d;
System.out.println(myNum);
```

Use float or double?

• The **precision** of a floating point value indicates how many digits the value can have after the decimal point. The precision of float is only six or seven decimal digits, while double variables have a precision of about 15 digits. Therefore it is safer to use double for most calculations.

Scientific Numbers

• A floating point number can also be a scientific number with an "e" to indicate the power of 10:

```
float f1 = 35e3f;
double d1 = 12E4d;
System.out.println(f1); //35000.0
System.out.println(d1); //120000.0
```

Booleans

• A boolean data type is declared with the boolean keyword and can only take the values true or false:

```
boolean isJavaFun = true;
boolean isFishTasty = false;
System.out.println(isJavaFun); // Outputs true
System.out.println(isFishTasty); // Outputs false
```

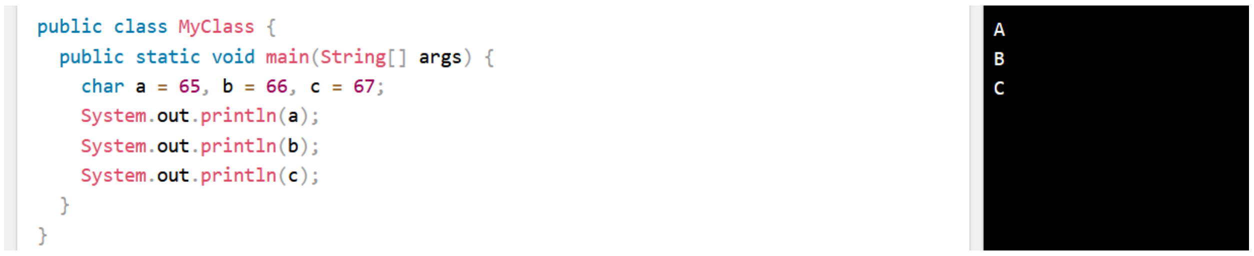
• Boolean values are mostly used for conditional testing, which you will learn more about in a later chapter.

Characters

• The char data type is used to store a **single** character. The character must be surrounded by single quotes, like 'A' or 'c':

```
char myGrade = 'B';
System.out.println(myGrade);
```

• Alternatively, you can use ASCII values to display certain characters:



```
public class MyClass {
  public static void main(String[] args) {
    char a = 65, b = 66, c = 67;
    System.out.println(a);
    System.out.println(b);
    System.out.println(c);
  }
}
```

```
A
B
C
```

Strings

• The String data type is used to store a sequence of characters (text). String values must be surrounded by double quotes:

```
String greeting = "Hello World";
System.out.println(greeting);
```

• The String type is so much used and integrated in Java, that some call it "the special **ninth** type".
• A String in Java is actually a **non-primitive** data type, because it refers to an object. The String object has methods that are used to perform certain operations on strings. **Don't worry if you don't understand the term "object" just yet**. We will learn more aboutstrings and objects in a later chapter.

Java Type Casting

Type casting is when you assign a value of one primitive data type to another type.
In Java, there are two types of casting:

• **Widening Casting** (automatically) converting a smaller type to a larger type size
byte → short → char → int → long → float → double

• **Narrowing Casting** (manually) - converting a larger type to a smaller size type
double → float → long → int → char → short → byte

Widening Casting

Widening casting is done automatically when passing a smaller size type to a larger size type:

```
public class MyClass {

public static void main(String[] args) {

int myInt = 9;
double myDouble = myInt; // Automatic casting: int to double
System.out.println(myInt); // Outputs 9
System.out.println(myDouble); // Outputs 9.0

}

}
```

Narrowing Casting

Narrowing casting must be done manually by placing the type in parentheses in front of the value:

```
public class MyClass {

public static void main(String[] args) {

double myDouble = 9.78;
int myInt = (int) myDouble; // Manual casting: double to int
System.out.println(myDouble); // Outputs 9.78
System.out.println(myInt); // Outputs 9

}

}
```