Variables, Data Types, and Math Operators

What to Expect in This Module

- Variables
- Primitive data types
- Arithmetic operators
- Type conversion

Variables

Named data storage

Strongly typed

Value can be modified

```
int dataValue;
dataValue = 100;
```

```
int myInfo = 200;
```

Naming Variables

- Variable naming is based on a combination of rules and conventions
  - Rules allow the use of letters, numbers, $ and _
    - By convention only letters and numbers are used
  - Rules require that first character is not a number
    - By convention it is always a letter
  - By convention follow the style often referred to as “Camel Case”
    - First letter is lowercase
    - Start of each word after the first is upper case
    - All other letters are lower case

```
int total;
int grade4;
int bankAccountBalance;
int level2Training;
```

Using Variables

```
public class Main {
   public static void main(Strings[] args) {
      int myVar;
      System.out.println(myVar);
      myVar = 50;
      System.out.println(myVar);

      int anotherVar = 100;
      System.out.println(anotherVar);

      myVar = anotherVar;
      System.out.println(myVar);

      anotherVar = 200;
      System.out.println(anotherVar);

      System.out.println(myVar);
   }
}
```

Error

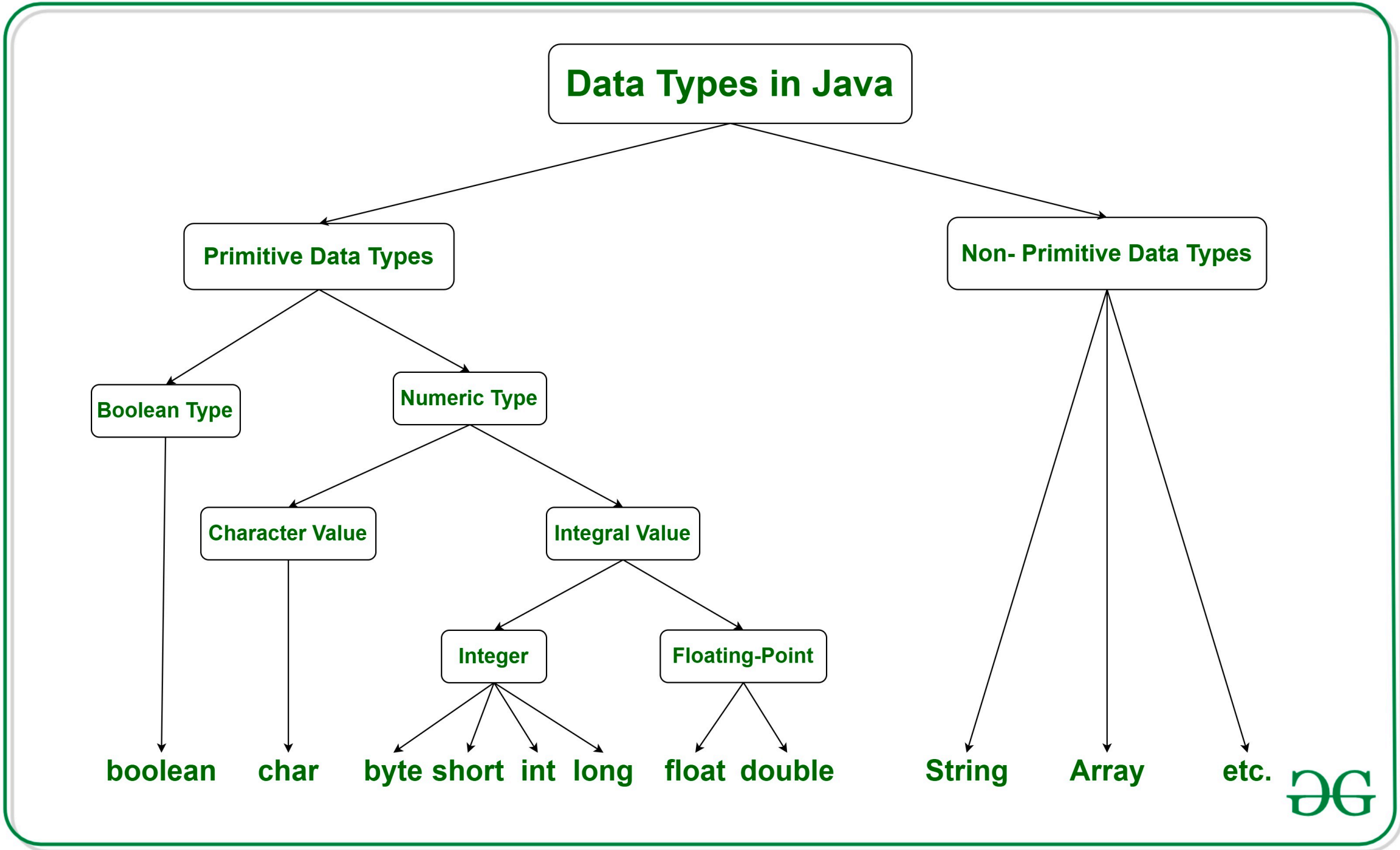
50

100

100

200

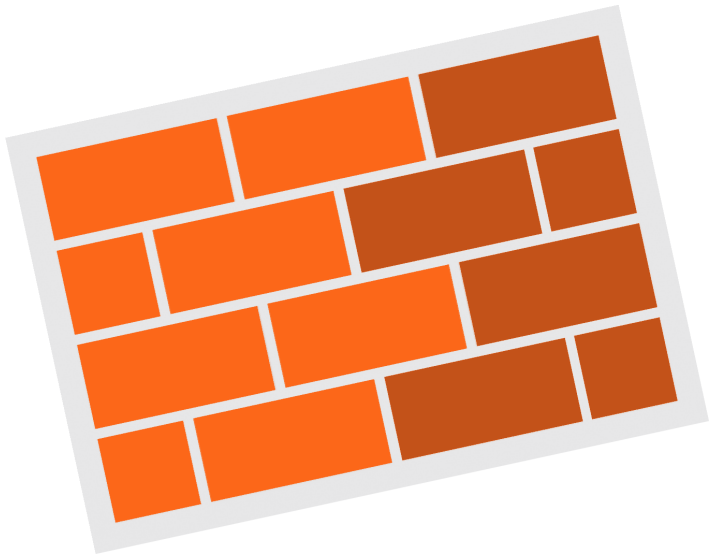
100


Data Types in Java
Primitive Data Types
Non- Primitive Data Types
Boolean Type
Numeric Type
Character Value
Integral Value
Integer
Floating-Point
boolean
char
byte
short
int
long
float
double
String
Array
etc.

Primitive Data Types

Built into the language

Foundation of all other types



Four categories of primitive types

- Integer
- Floating point
- Character
- Boolean

Integer Types

Type	Size (bits)	Min Value	Max Value	Literal Format
byte	8	-128	127	0
short	16	-32768	32767	0
int	32	-2147483648	2147483647	0
long	64	-9223372036854775808	9223372036854775807	0L

```
byte numberOfEnglishLetters = 26;
short feetInAMile = 5283;
int milesToSun = 92960000;
long nationalDebt = 18100000000000L;
```

Floating PointTypes

- Implementation of IEEE 754 floating point standard
- Stores values containing a fractional portion
- Supports positive, negative, and zero values

Type	Size (bits)	Smallest Positive Value	Largest PositiveValue	Literal Format
float	32	1.4×10^{-45}	3.4×10^{38}	0.0f
double	64	4.9×10^{-324}	1.7×10^{308}	0.0 or 0.0d

```
float milesInAMarathon = 26.2f;
double atomWidthInMeters= 0.0000000001d;
```

Character and Boolean Types

- The char type stores a single Unicode character
  - Literal values placed between single quotes
  - For Unicode code points, use \u followed by 4-digit hex value

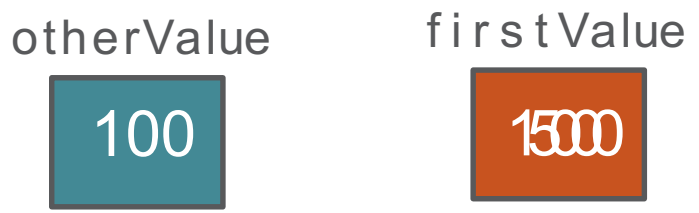
```
char regularU = 'U';
char accentedU = '\u00DA'; // Ú
```

- The boolean type stores true/false values
  - Literal values are true and false

```
boolean iLoveJava = true;
```

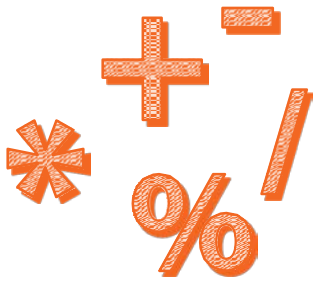
Primitive Types Are Stored By-value

```
int firstValue = 100;
int otherValue = firstValue;
firstValue = 50;
```

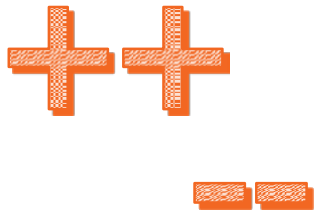


Arithmetic Operators

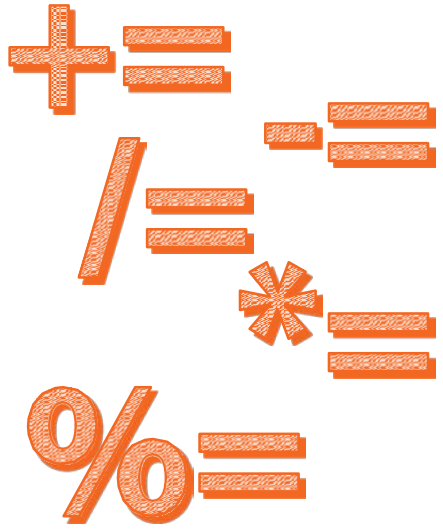
Basic operators



Prefix/postfix operators



Compound assignment operators



Basic Math Operators

	Operator	Floating Point Example		Integer Example	
Add	+	1.0 + 2.0	**3.0**	1 + 2	**3**
Subtract	-	5.0 - 4.0	**1.0**	5 -4	**1**
Multiply	*	4.0 * 2.0	**8.0**	4 * 2	**8**
Divide	/	13.0 /5.0	**2.6**	13 /5	**2**
Modulus	%	13.0 % 5.0	**3.0**	13 % 5	**3**

Prefix /Postfix Operators

++ increments value by 1

-- decrements value by 1

As prefix applies operation before returning value

As postfix applies operation after returning value

```
int myVal = 5;
System.out.println(++myVal);
System.out.println(myVal);
```

6
6

```
int myVal = 5;
System.out.println(myVal++);
System.out.println(myVal);
```

5
6

Operator Precedence

Operators are evaluated in a well-defined order

Operators of equal precedence are evaluated left-to-right

Can override precedence with parenthesis

Nested parenthesis evaluated from the inside out

Postfix	x++ x--
Prefix	++x --x
Multiplicative	* / %
Additive	+ -

Summary

- Variables are strongly typed in Java
- Primitive types
  - Integer types, floating point types, char type, boolean type
- Math operators
  - Basic operators, postfix/prefix operators
- Math operators follow a well-defined order of precedence