# COMP 110/L Lecture 3

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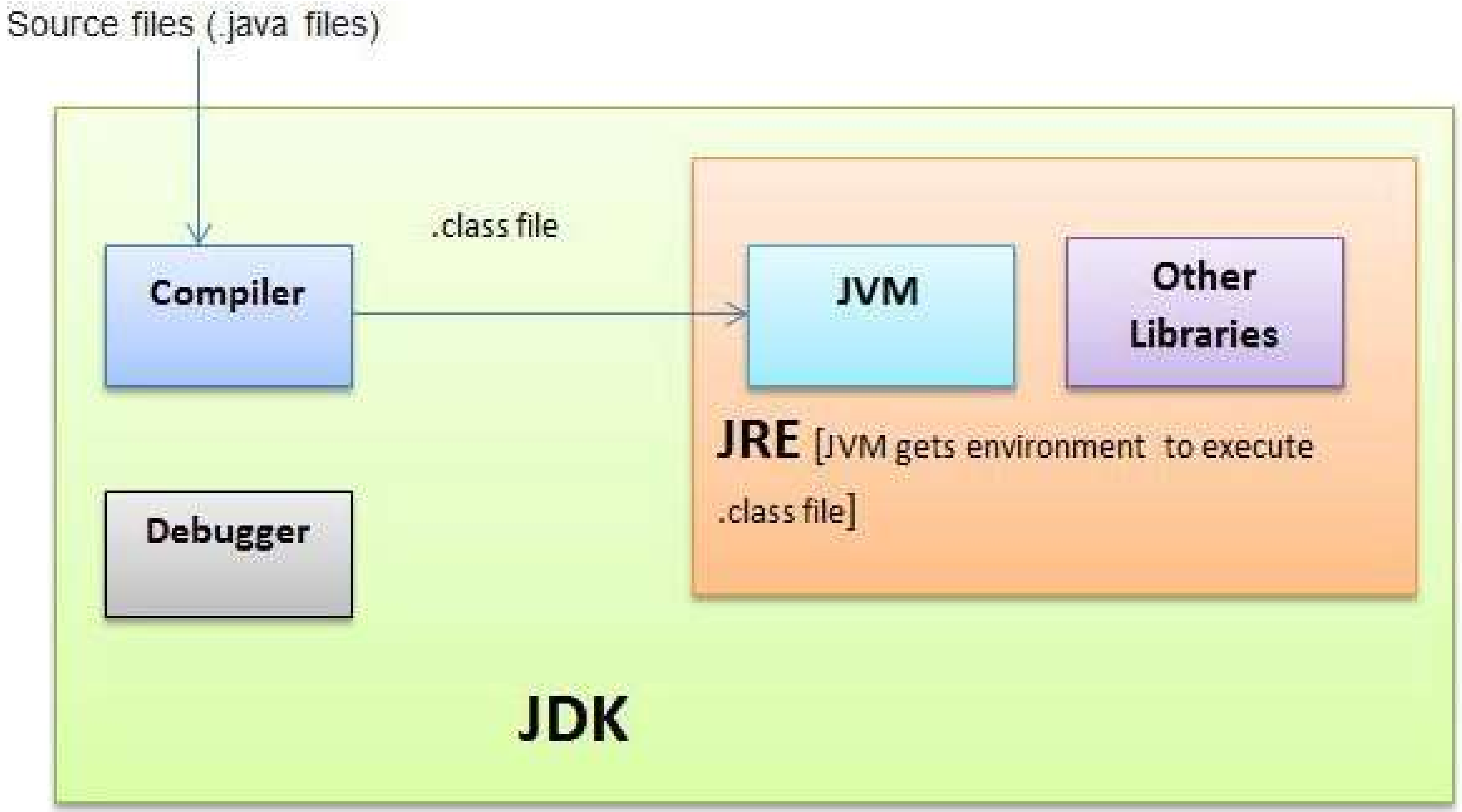
Slides are adapted from Dr. Kyle Dewey


Source files (.java files)
Compiler
.class file
JVM
Other Libraries
JRE [JVM gets environment to execute .class file]
Debugger
JDK

## Outline

- Types (`int` and `String`)
- String concatenation
- Variables
- User input

## Types

## Expressions

- From the last lab, you wrote code like:
  - `“Hello, world!”`
  - `2 * (1 + 4)`
- Each of these is an expression (produces a value)

## Types

- All values are of a particular type
  - `“Hello, world!”: String`
  - `2 * (1 + 4): int` (integers)

- Transitively, all expressions are of a particular type

## String Concatenation

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"foo" + "bar"
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```
"foo" + "bar" + "baz"
"foobarbaz"
```

## Demo:
## `StringConcat.java`

## Concatenation with `int`

String concatenation also works with Strings and integers (`int`).

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```
“foo7”
```

```
“bar” + 28
```

## Concatenation with `int`

String concatenation also works with Strings and integers (`int`).

```
“foo” + 7

“foo7”
```

```
“bar” + 28

“bar28”
```

## Demo:

`IntStringConcat.java`

## 2 vs. "2"

## Variables

## Variables

- Related to variables in math
- A named “box” you can put a  value in

# Variables

**A variable is a container** which holds values that are used in a Java program.

Do you remember the basic math you learned in school?

$$y = x + 1$$

Here, as you can see, **the y variable changes when the x variable is different**. For example:

- ❑ if $x = 1$, then $x + 1 = 2$
- ❑ if $x = 2$, then $x + 1 = 3$
- ❑ if $x = 1.5$, then $x + 1 = 2.5$

In Java, variables play the same role as in the above math example: $y = x + 1$. So, variables are containers that hold values.

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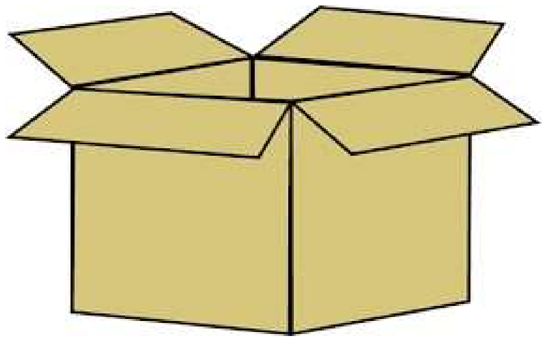

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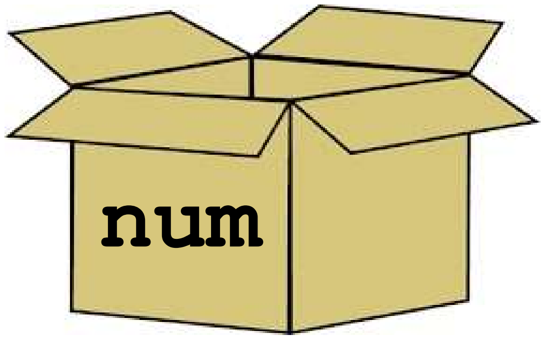

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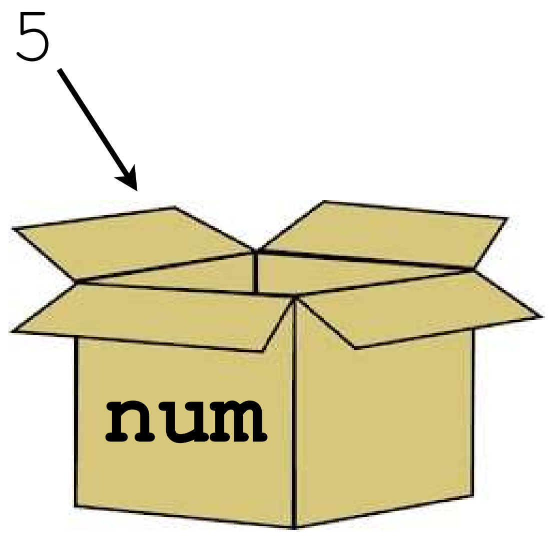

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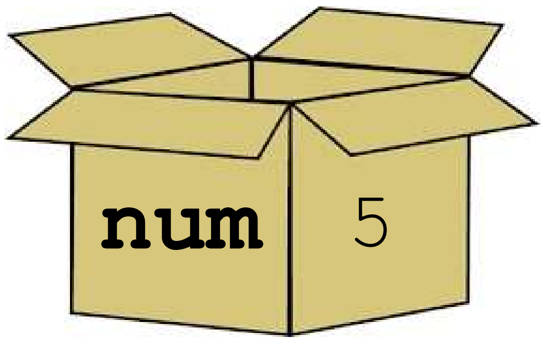

# Variables

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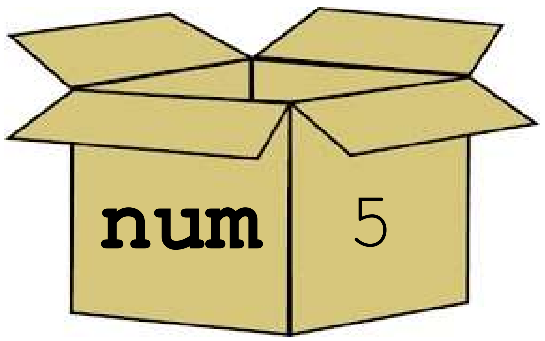
`num?`



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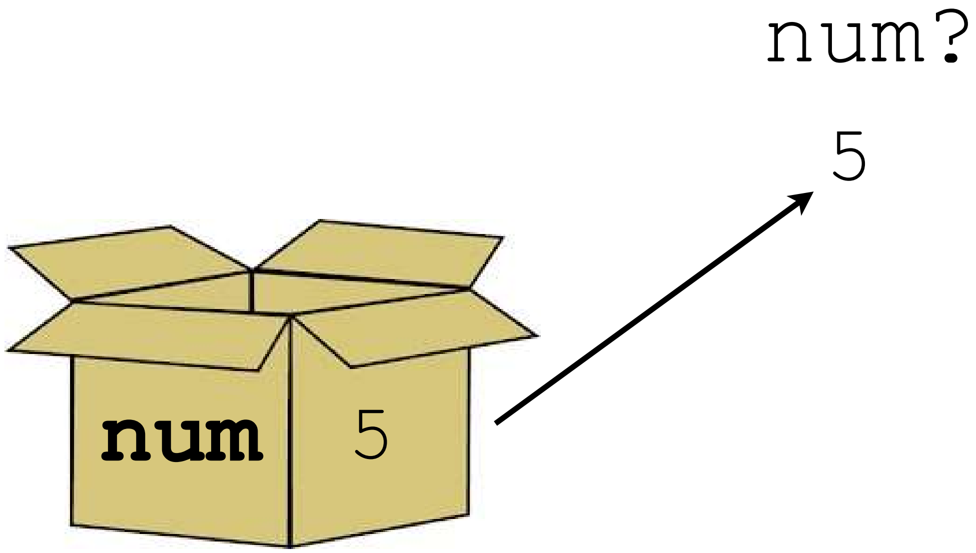

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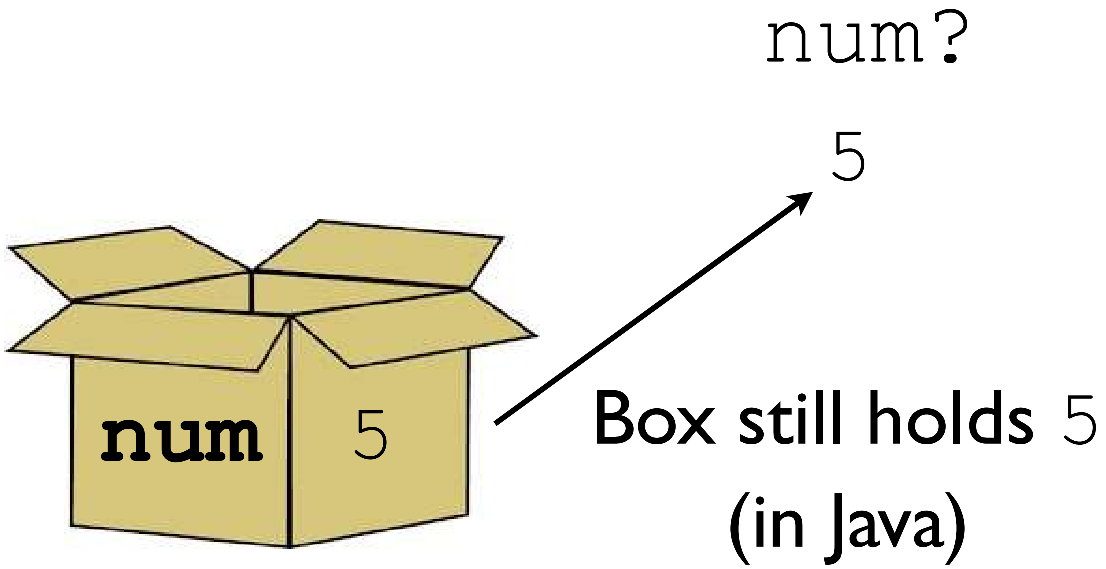

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Part of this declaration includes the *type* of the thing we want to put into the box.

```
int num;
```

Variable named `num`, holds values of type `int`

```
String str;
```

Variable named `str`, holds values of type `String`

## Example:
`VariableDeclarations.java`

# Putting Values in the Box

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```
int num = 7;
int otherNum = num;
int thirdNum = num + otherNum;
```

## Example:
`VariableUsage.java`

## Question

- Variables can have their values *reassigned*
- Question: what might this code snippet print?

```
int num = 9;
num = 12;
System.out.println(num);
```

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- Question: what might this code snippet print?

```
int num = 9;
num = 12;
System.out.println(num);
```

Answer: `12`

## User Input

## Program Input

- Programs without input can’t do much
  - Can only produce predetermined values
- We’ll look at one kind of input: user input from the console/terminal

# Reading in Input

New bit of magic: `Scanner`

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New bit of magic: `Scanner`

```
import java.util.Scanner;

public class Test {
  public static void
  main(String[] args) {
    Scanner in =
      new Scanner(System.in);
    ...
```

-The code above creates a Scanner, assigning it into variable in
-Once the Scanner is created, you can do things with it.

## Reading in Integers (`int`)

```
Scanner in = new Scanner(System.in);
int first = in.nextInt();
int second = in.nextInt();
int third = in.nextInt();

// above code reads in
// three integers from the user
```

## Demo:
`AddTwo.java`

## Reading in Text(`String`)

```
Scanner in = new Scanner(System.in);
String firstLine = in.nextLine();
String secondLine = in.nextLine();

// above code reads in two lines
// of text
```

## Demo:
`Parrot.java`

## Demo:
`DoubleParrot.java`

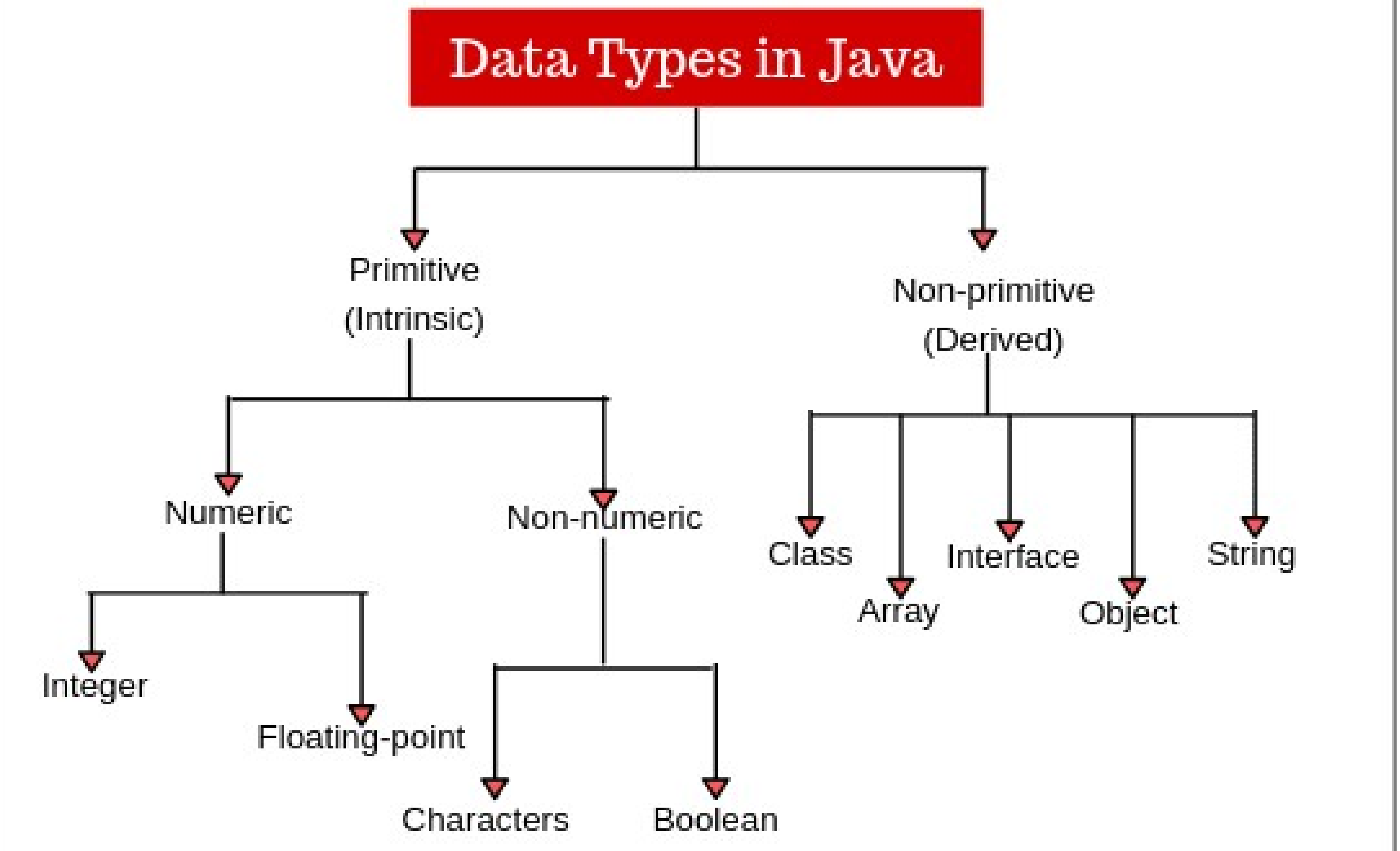

Fig: Classification of data types in java

|  | DATA TYPE | RANGE OF VALID VALUES | MEMORY VOLUME |
|---|---|---|---|
| integer | byte | from -128 to 127 | 1 byte |
|  | short | from -32768 to 32767 | 2 bytes |
|  | int | from -2147483648 to 2147483647 | 4 bytes |
|  | long | from -9223372036854775808 to 9223372036854775807 | 8 bytes |
| floating point | float | from -3.4E + 38 to 3.4E + 38 | 4 bytes |
|  | double | from -1.7E + 308 to 1.7E + 308 | 8 bytes |
| symbols | char | from 0 to 65536 | 2 bytes |
| logical | boolean | true or false | For value of this type 1 bit is enough, but in reality memory isn't provided by such portions, so variables of this type may be packed by virtual machine in different ways |

```java
// Java program to read data of various types using Scanner class.
import java.util.Scanner;
public class ScannerDemo1
{
    public static void main(String[] args)
    {
        // Declare the object and initialize with
        // predefined standard input object
        Scanner sc = new Scanner(System.in);

        // String input
        String name = sc.nextLine();

        // Character input
        char gender = sc.next().charAt(0);

        // Numerical data input
        // byte, short and float can be read
        // using similar-named functions.
        int age = sc.nextInt();
        long mobileNo = sc.nextLong();
        double cgpa = sc.nextDouble();

        // Print the values to check if the input was correctly obtained.
        System.out.println("Name: "+name);
        System.out.println("Gender: "+gender);
        System.out.println("Age: "+age);
        System.out.println("Mobile Number: "+mobileNo);
        System.out.println("CGPA: "+cgpa);
    }
}
```