



Northeastern
University

Lecture 9: Object Oriented Programming - 4

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Materials are edited by Prof. Jones Yu from

Liang, Y. Daniel. Introduction to Java Programming and Data Structures, Comprehensive
Version, 12th edition, Pearson, 2019.

Outline

- Objects and Classes
- Thinking in Objects

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Processing Primitive Data Type Values as Objects

Primitive Data Type

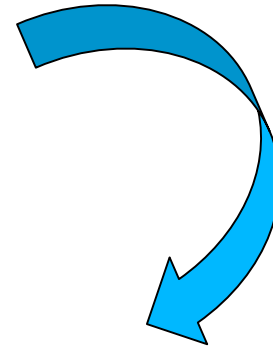
Primitive Data Type Value

int a = **5**;

Integer a = **new** Integer(5);

Class Data Type

Object of Integer Class Type



Wrapper Classes

- Byte
- Short
- Integer
- Long
- Float
- Double
- Boolean
- Character

NOTE:

- (1) The wrapper classes **do not** have no-arg constructors.
- (2) The instances of all wrapper classes are **immutable**, i.e., their **internal values** cannot be changed once the objects are created.

The Integer and Double Class

java.lang.Integer

```
-value: int
+MAX VALUE: int
+MIN VALUE: int

+Integer(value: int)
+Integer(s: String)
+byteValue(): byte
+shortValue(): short
+intValue(): int
+longVlaue(): long
+floatValue(): float
+doubleValue():double
+compareTo(o: Integer): int
+toString(): String
+valueOf(s: String): Integer
+valueOf(s: String, radix: int): Integer
+parseInt(s: String): int
+parseInt(s: String, radix: int): int
```

java.lang.Double

```
-value: double
+MAX VALUE: double
+MIN VALUE: double

+Double(value: double)
+Double(s: String)
+byteValue(): byte
+shortValue(): short
+intValue(): int
+longVlaue(): long
+floatValue(): float
+doubleValue():double
+compareTo(o: Double): int
+toString(): String
+valueOf(s: String): Double
+valueOf(s: String, radix: int): Double
+parseDouble(s: String): double
+parseDouble(s: String, radix: int): double
```

The Integer and Double Class

- Constructors
- Class Constants `MAX_VALUE`, `MIN_VALUE`
- Conversion Methods

Numeric Wrapper Class - Constructors

- You can construct a wrapper object either from a primitive data type value or from a string representing the numeric value.
- The constructors for Integer and Double are:

```
public Integer(int value)
```

```
public Integer(String s)
```

```
public Double(double value)
```

```
public Double(String s)
```

Numeric Wrapper Class - Constants

- Each numerical wrapper class has the constants `MAX_VALUE` and `MIN_VALUE`.
- `MAX_VALUE`:
 - » maximum value of the corresponding primitive data type.
- `MIN_VALUE`:
 - » For `Byte`, `Short`, `Integer`, and `Long`, it represents the minimum `byte`, `short`, `integer`, and `long` values.
 - » For `Float` and `Double`, it represents the minimum *positive* `float` and `double` values.

Conversion Methods

- Each numeric wrapper class **implements** the **abstract methods** `doubleValue`, `floatValue`, `intValue`, `longValue`, and `shortValue`, which are defined in the `Number` (abstract) class.
- These methods “convert” **objects** into **primitive type values**.

Exercise

- Please ask the user to enter an integer and use this input value to create an `Integer` object.
- Print out this `Integer` object's value.

Answer

```
import java.util.Scanner;

public class ClassExercise {

    public static void main(String[] args) {

        Scanner input = new Scanner(System.in);

        System.out.print("Please enter an integer: ");

        int i = input.nextInt();

        Integer value = new Integer(i);

        System.out.print("The input value is " + value.intValue());

        input.close();

    }

}
```

The Static `valueOf` Methods

- The numeric wrapper classes have a useful **class (static) method**, `valueOf(String s)`.
- This method **creates a new object** initialized to the value represented by the specified string. For example:

```
Double doubleObject = Double.valueOf("12.4");  
Integer integerObject = Integer.valueOf("12");
```

The Methods for Parsing Strings into Numbers

- We can use the `static parseInt` method in the `Integer` class to parse a numeric string into an `int` value and the `static parseDouble` method in the `Double` class to parse a numeric string into a `double` value.
- Each numeric wrapper class has two `overloaded parsing methods` to parse a numeric string into an appropriate numeric value.

```
// These two methods are in the Integer class
public static int parseInt(String s)
public static int parseInt(String s, int radix)
```

Exercise

- Type in following code and see what is the output of the following code?

```
public class ClassExercise {  
    public static void main(String[] args){  
        System.out.println(Integer.parseInt("14"));  
        System.out.println(Integer.parseInt("14",10));  
        System.out.println(Integer.parseInt("14",16));  
  
        System.out.println(Integer.parseInt("13"));  
        System.out.println(Integer.parseInt("13",10));  
        System.out.println(Integer.parseInt("13",16));  
    }  
}
```


Answer

14
14
20
13
13
19

Exercise

- Assume you have a `Double` class type variable `x`. The `x` value is 3.3.

`Double x = 3.3;`

- Could you print out the real number part by using a `Double` class method?
- Could you compare `x` value with 5.5 by using a `Double` class method? If they are the same, output 0. Otherwise, output -1.

Answer

```
public class ClassExercise {  
    public static void main(String[] args){  
        Double x = 3.3;  
        System.out.println(x.intValue());  
        System.out.println(x.compareTo(5.5));  
    }  
}
```

output:

3

-1

The String Class

The String Class

- Constructing a String:

```
String message = "Welcome to Java";
```

```
String message = new String("Welcome to Java");
```

- Can obtain String length (`.length()`) and retrieve individual characters (`.charAt(index)`)
- String Concatenation: `concat`
- Substrings: `substring(index)`, `substring(start, end)`
- Comparisons: `equals`, `compareTo`

The String Class (cont.)


- String Conversions (between Strings and Arrays):
`.toArray()`

```
char[] charArray = s.toArray();
```

- Converting characters and numeric values to Strings:
`.valueOf(char)`, `.valueOf(int)`

Constructing Strings

```
String newString = new String(stringLiteral);  
String message = new String("Welcome to Java");
```



- Since strings are used frequently, Java provides a shorthand initializer for creating a string:

```
String message = "Welcome to Java";
```

Strings Are Immutable

- A String object is **immutable**; its contents cannot be changed.
- Does the following code change the contents of the string?

```
String s = "Java";  
  
s = "HTML";
```

- The answer is no. Why?