THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL

COMP 110
Introduction to Programming

Fall 2015

Time: TR 9:30 – 10:45

Room: AR 121 (Hanes Art Center)

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Previous Class

- What did we discuss?

Today

- Announcements
  - Lab1: **due Wed, Sep 9 at 11:55 PM**
  - Midterm is on Thu, Oct 8
- More If-else

Some Terminology follows…

Class Loader

- A Java program typically consists of several pieces called *classes.*
- Each class may have a separate author and each is compiled (translated into byte-code) separately.
- A *class loader* (called a *linker* in other programming languages) automatically connects the classes together.

Programmer, User, Package…

- The person who writes a program is called the *programmer.*
- The person who interacts with the program is called the *user.*
- A *package* is a library of classes that have been defined already.
  - `import java.util.Scanner;`

Arguments, Variables…

- The item(s) inside parentheses are called *argument(s)* and provide the information needed by methods.
- A *variable* is something that can store data.
- An instruction to the computer is called a *statement*; it ends with a semicolon.
- The grammar rules for a programming language are called the *syntax* of the language.

Programming

- Programming is a creative process.
- Programming can be learned by discovering the techniques used by experienced programmers.
- These techniques are applicable to almost every programming language, including Java.

Object-Oriented Programming

- Our world consists of *objects* (people, trees, cars, cities, dogs, etc.).
- Objects have state and behavior. A car has *state* (model, color, fuel level, etc), and *behavior* (start, change gear, brake, etc).
- An object's behavior can affect its state and the state of other objects.
- Object-oriented programming (*OOP*) treats a program as a collection of objects, each with behaviors and state.

OOP Terminology

- Behaviors are included as *methods.*
- State is contained in a set of attributes.
- A class defines the methods and attributes.
- An object is an instance of a class. A program may have several instances of a class. (myCar, yourCar, herCar)
- Each object (instance of a class) has the same set of methods, but its own attribute values. (state)

Scanner Class

```
Scanner keyboard = new Scanner(System.in);
keyboard.nextLine();
```

- **`Scanner`** is a class
- **`keyboard`** is an instance of the Scanner class
- **`nextLine()`** is a method (behavior) of the Scanner class.
- The Scanner has an internal attribute (state) which stores the delimiter.

Scanner Class

- The object performs an action when you *invoke* or *call* one of its methods

```
objectName.methodName(argumentsTheMethodNeeds);
```

Algorithms

- By designing methods, programmers provide actions for objects to perform.
- An *algorithm* describes a means of performing an action.
- Once an algorithm is defined, expressing it in Java (or in another programming language) usually is easy.

Algorithms

- An algorithm is a set of instructions for solving a problem.
- An algorithm must be expressed completely and precisely.
- Algorithms usually are expressed in English or in *pseudocode.*

The Class `String`

- We've used constants of type `String` already.
  `"Enter a whole number from 1 to 99."`
- A value of type `String` is a
  - Sequence of characters
  - Treated as a single item.

String Methods

- An object of the `String` class stores data consisting of a sequence of characters.
- Objects have methods as well as data
- The `length()` method returns the number of characters in a particular `String` object.
- Try this:

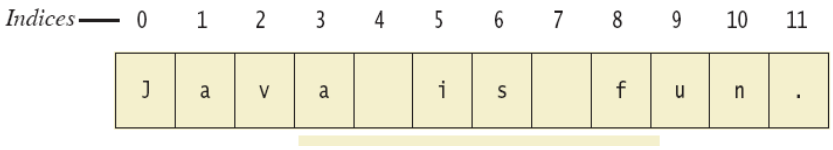
```
String greeting = "Hello";
int n = greeting.length();
System.out.println("Length of the string is " + n);
```

The Method `length()`

- The method `length()` returns an `int`.
- You can use a call to method `length()` anywhere an `int` can be used.

```
int count = command.length();
System.out.println("Length is " +
    command.length());
count = command.length() + 3;
```


`String` Indices



- Positions start with 0, not 1.
  - The 'J' in "Java is fun." is in position 0
- A position is referred to an an *index.*
  - The `'f'` in `"Java is fun."` is at index 8.

`String` Methods

`charAt (`*Index*`)` Returns the character at *Index* in this string. Index numbers begin at 0.
`compareTo(`*A_String*`)` Compares this string with *A_String* to see which string comes first in the lexicographic ordering. (Lexicographic ordering is the same as alphabetical ordering when both strings are either all uppercase letters or all lowercase letters.) Returns a negative integer if this string is first, returns zero if the two strings are equal, and returns a positive integer if *A_String* is first.
`concat(`*A_String*`)` Returns a new string having the same characters as this string concatenated with the characters in *A_String*. You can use the ⇓ operator instead of `concat`.
`equals(`*Other_String*`)` Returns true if this string and *Other_String* are equal. Otherwise, returns false.

Methods and their return types…

`String` Methods

`equalsIgnoreCase(`*Other_String*`)` Behaves like the method `equals`, but considers uppercase and lowercase versions of a letter to be the same.
`indexOf(`*A_String*`)` Returns the index of the first occurrence of the substring *A_String* within this string. Returns -1 if *A_String* is not found. Index numbers begin at 0.
`lastIndexOf(`*A_String*`)` Returns the index of the last occurrence of the substring *A_String* within this string. Returns -1 if *A_String* is not found. Index numbers begin at 0.

`String` Methods

`length()` Returns the length of this string.
`toLowerCase()` Returns a new string having the same characters as this string, but with any uppercase letters converted to lowercase.
`toUpperCase()` Returns a new string having the same characters as this string, but with any lowercase letters converted to uppercase.

`String` Methods

`replace(`*OldChar*, *NewChar*`)` Returns a new string having the same characters as this string, but with each occurrence of *OldChar* replaced by *NewChar*.
`substring(`*Start*`)` Returns a new string having the same characters as the substring that begins at index *Start* of this string through to the end of the string. Index numbers begin at 0.
`substring(`*Start*, *End*`)` Returns a new string having the same characters as the substring that begins at index *Start* of this string through, but not including, index *End* of the string. Index numbers begin at 0.
`trim()` Returns a new string having the same characters as this string, but with leading and trailing whitespace removed.

Putting Quotes in a String

- What do you do if you want to output
  - How do I put "quotes" in my string?
- This won't work!
  - `System.out.println("How do I put "quotes" in my string?");`
- You have to let the computer know that you want the quote marks to be in the String
  - `System.out.println("How do I put \"quotes\" in my string?");`

Backslashes

- Backslash in a String means: **the next character is special**
  - `System.out.println("How do I put a \\ in my string?");`
- It will print:

```
How do I put a \ in my string?
```

Escape Characters

\”	Double quote
\’	Single quote
\\	Backslash
\n	New line
\t	Tab

- Each escape sequence is a single character even though it is written with two symbols.

Escape Characters

- How would you print
  `"Java" refers to a language.` ?
- The compiler needs to be told that the quotation marks (`"`) do not signal the start or end of a string, but instead are to be printed.

```
System.out.println(
"\"Java\" refers to a language.");
```

Examples – try these

```
System.out.println("abc\\def");
```

```
abc\def
```

```
System.out.println("new\nline");
```

```
new
line
```

```
char singleQuote = '\'';
System.out.println
  (singleQuote);
```

```
'
```


If and Else

- You can use only one if statement
  - *if* ***(boolean expression)***
    { statements; }
    other statements;
    - *Other statements* will always be executed
- You can also use an if-else statement
  - *if* ***(boolean expression)***
    { statement 1; }
    else ***{ statement 2; }***
    - If the *expression* is true, run *statement 1*, otherwise run *statement 2*

Using If and Else

- Use if-else statement
- Do not use two if statements
- Always pay attention to boundaries
  - Is it “>” or “>=”?
  - Is it “<” or “<=”?
  - Do you need a “==”?

Using If-Else

- Pay attention to **the brackets {}**
  - You can discard them if there is only one statement

```
if (inputInt > 0) {
      System.out.println(“Positive”);
}
else {
   System.out.println(“Negative or zero”);
}
```

```
if (inputInt > 0)
      System.out.println(“Positive”);
else
   System.out.println(“Negative or zero”);
```

Using If-Else

- Pay attention to **the brackets {}**
  - if there is only one statement in {}, discard them
  - If multiple statements, discarding {} will cause problems
  - ***if (inputInt > 0)***
    System.out.println("Positive");
    else
    System.out.println("Negative or zero");
    System.out.println("What's happening?");
    // will always be executed

Using If-Else

- Pay attention to **the brackets {}**
  - As a good habit, don't discard them, even if you have only one statement in it
    - The only exception: **multibranch if-else**

Using If-Else

- Never put a semicolon after ***if*** or ***else***
  - ***if (inputInt > 0);***
    System.out.println("What's happening now?");
- Compiler will interpret it as
  - ***if (inputInt > 0)***
    { ;}
    System.out.println("What's happening now?");

Next class

- More if-else

→ Reading Assignment: Chapter 2