CSSE 220 Day 2

Class, Objects, and Methods in Java
UML Class Diagram Basics

Your questions about …

- The syllabus
- Java
- etc.

- Could everyone checkout and commit the HW1 project?

Announcements

- Sit on the right side or as close to the front on the left side of the room as you can.
- Please consider making your picture on ANGEL visible to students in your courses.
  - Home→ Preferences (wrench icon)→ Personal info
- **If you want all of your ANGEL mail to also go to your regular mail, you can set it that way.**
  - Home→ Preferences → System Settings
- You can subscribe to the ANGEL discussion forums. (From the Communicate menu)

More announcements

- Cell Phones
  - please set ringers to silent or quiet.
    - Minimize class disruptions.
    - But sometimes there are emergencies.
- Personal needs
  - If you need to leave class for a drink of water, a trip to the bathroom, or anything like that, you need not ask me. Just try to minimize disruptions.
- Please be here and have your computer up and running by class time as best you can.

Bonus points for reporting bugs

- In the textbook
- In any of my materials.
- Use the Bug Report Forum on ANGEL
- More details in the Syllabus

- Subscribe to the discussion forums on ANGEL

Some major emphases of 220

- *Reinforce from 120:*
  - Procedural programming (functions, conditionals, loops, etc)
  - Using objects
- *Object-Oriented Design*
  - Major emphasis on interfaces
  - GUI programming using Java Swing
  - UML class diagrams
- *Software Engineering concepts*
- *Data Structures*
  - Introduce algorithm efficiency analysis
  - Abstract data types
  - Specifying and using standard data structures
  - Implementing simple data structures (lists)
- *Recursion*
- *Sorting and searching algorithms*
  - as examples for the above

What will I spend my time doing?

- Small programming assignments in class
- Larger programming problems, mostly outside of class
  - Exploring the JDK documentation to find the classes and methods that you need
  - Debugging!
  - Reviewing other students’ code
- Reading (a lot to read at the beginning; less later)
  - Thinking about exercises in the textbooks
  - Some written exercises, mostly from the textbook
- Discussing the material with other students

Identifiers (Names) in Java

- The rules:
  - Start with letter or underscore (_)
  - Followed by letters, numbers, or underscores

- The conventions:
  - `variableNamesLikeThis`
  - `methodNamesLikeThis(…)`
  - `ClassNamesLikeThis`

Q1 – Q3

Variables in Java

- Like C:
  - `int xCoordinate = 10;`

- But Java catches some mistakes:

```
int width, height, area;
area = width * height;
```

What does this do in C?

  - Java will detect that `width` and `height` aren't initialized!

Using Objects and Methods

- Works just like Python:
  - *object.method(argument, ...)*

Implicit argument

Explicit arguments

"Who does What, With What?"

- Java Example:

```
String name = "Bob Forapples";
PrintStream printer = System.out;

int nameLen = name.length();
printer.printf("'%s' has %d characters", name, nameLen);
```

The dot notation is also used for *fields*

Q4

Separating Use from Implementation

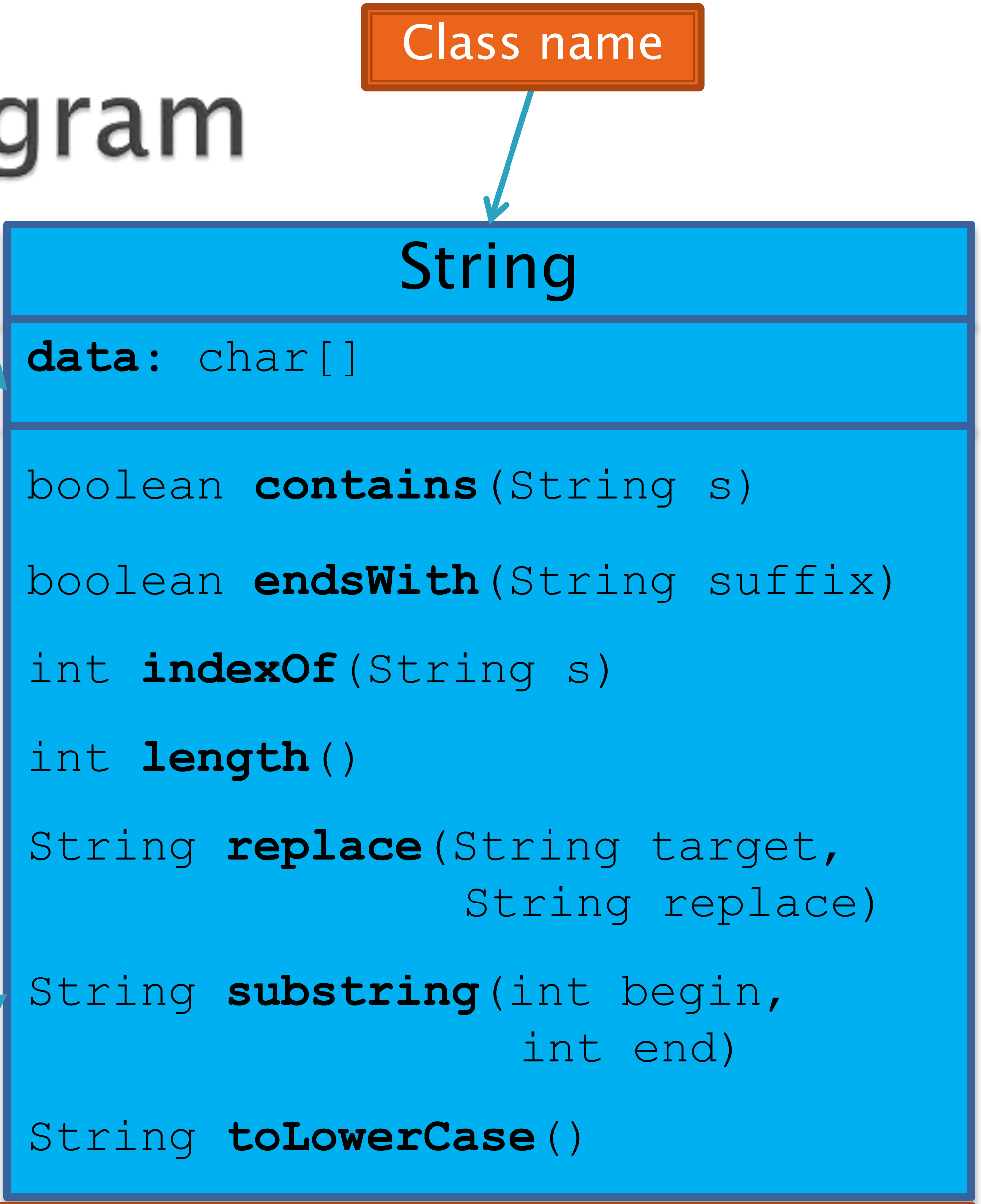
- Can use methods of an object without knowing how they are implemented
  - Recall zellegraphics from csse 120:

    ```
    line.setWidth(5)
    ```

UML Class Diagram

- Shows the:
  - ***Attributes*** (data, called ***fields*** in Java) and
  - ***Operations*** (functions, called ***methods*** in Java)

  of the objects of a class
- Does *not* show the implementation
- Is *not* necessarily complete



```
String
----------------------------------------
data: char[]
----------------------------------------
boolean contains(String s)
boolean endsWith(String suffix)
int indexOf(String s)
int length()
String replace(String target,
               String replace)
String substring(int begin,
                 int end)
String toLowerCase()
```

String methods are *immutable* – if the method produces a String, the method *returns* that String rather than mutating (changing) the implicit argument

Exercise

- Checkout ObjectsAndMethods from SVN

  Work on UsingStrings.java

Passing Parameters

- Arguments can be any expression of the “right” type
  - See example…
- What happens if we try to give `substring()` an explicit argument that isn’t a number?
  - How does the compiler know that `rhit.length()` evaluates to a number?
  - What’s the return type of `length()`?
- Static types help the compiler catch bugs.
  - Important in large programs

```
String rhit = “Rose-Hulman”;
System.out.println("Rose");
System.out.println(rhit.substring(0, 4));
System.out.println(rhit.substring(0, 2+2));
System.out.println(rhit.substring(0, rhit.length() - 7));
System.out.println("Rose-Hulman".substring(0, 4));
```

Primitive types

Primitive Type	What It Stores	Range
`byte`	8-bit integer	–128 to 127
`short`	16-bit integer	–32,768 to 32,767
`int`	32-bit integer	–2,147,483,648 to 2,147,483,647
`long`	64-bit integer	-2^{63} to $2^{63} - 1$
`float`	32-bit floating-point	6 significant digits (10^{-46}, 10^{38})
`double`	64-bit floating-point	15 significant digits (10^{-324}, 10^{308})
`char`	Unicode character	
`boolean`	Boolean variable	`false` and `true`

figure 1.2

The eight primitive types in Java

Most common number types in Java code

Q5

Exercise

- Work on SomeTypes.java

Constructing Objects

x, y, width, height

- Example:

```
Rectangle box = new Rectangle(5, 10, 20, 30);
```

- Several steps are happening here:
  1. Java reserves space for a `Rectangle` object
  2. `Rectangle`'s *constructor* runs, filling in slots in object
  3. Java reserves a variable named `box`
  4. `box` is set to refer to the object

Q6

Accessors and Mutators

- *Accessor* methods
  - Get a value from an object
  - Examples:
    - `box.getHeight()`
    - `box.getWidth()`

- *Mutator* methods
  - Change the *state* of an object (i.e., the value of one or more fields)
  - Examples:
    - `box.translate(10, 20)`
    - `box.setSize(5, 5)`

Tip: Use mutators with care!

Q7–Q8

Reminder: In all your code:

- Write appropriate comments:
  - Javadoc comments for public fields and methods.
  - Explanations of anything else that is not obvious.
- Give self-documenting variable and method names:
  - Use name completion in Eclipse, Ctrl-Space, to keep typing cost low and readability high.
- Use **Ctrl-Shift-F** in Eclipse to format your code.
- Take care of all auto-generated TODO’s.
  - Then delete the TODO comment.
- Correct ALL compiler warnings.
  - Quick Fix is your friend!

Java Documentation

- API Documentation, Docs in Eclipse, Writing your own Docs

Java API Documentation

- What's an API?
  - Application Programming Interface

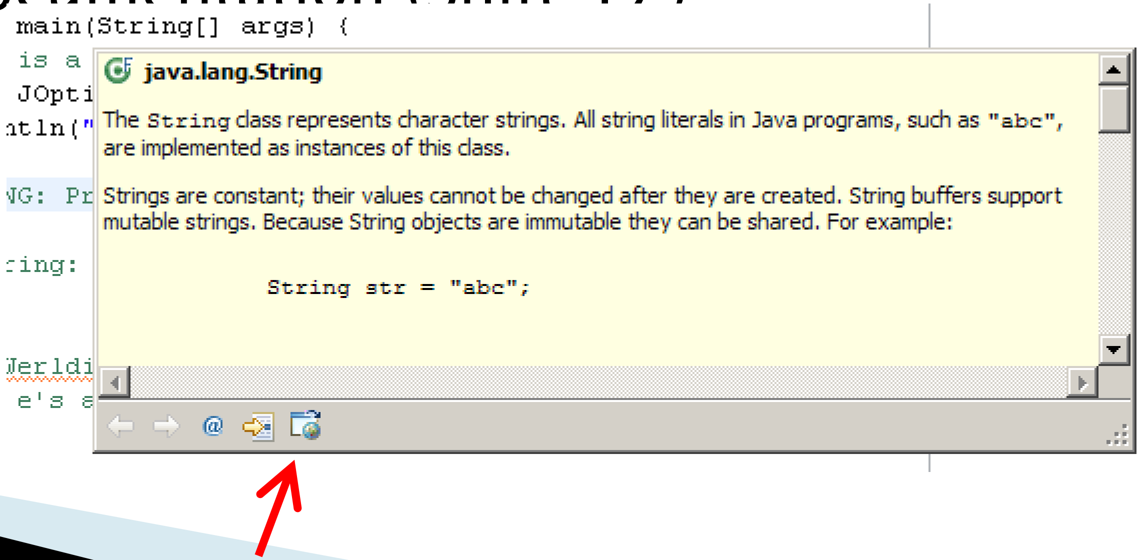
You need the 6 to get the current version of Java

- The Java API on-line
  - Google for: java api documentation 6
  - Or go to: http://java.sun.com/javase/6/docs/api/
  - Also hopefully on your computer at C:\Program Files\Java\jdk1.6.0_14\docs\api\index.html

Q9

Java Documentation in Eclipse

- Setting up Java API documentation in Eclipse
  - Should be done already,
  - If the next steps don't work for you, instructions are in today's homework
- Using the API documentation in Eclipse
  - Hover text
  - Open external documentation (Shift-F2)



java.lang.String

The `String` class represents character strings. All string literals in Java programs, such as `"abc"`, are implemented as instances of this class.

Strings are constant; their values cannot be changed after they are created. String buffers support mutable strings. Because String objects are immutable they can be shared. For example:

```
        String str = "abc";
```

Exercise

- Finish quiz and pass it in
  Continue working on homework

Q10 – 11