# CSSE 220

Objects

Check out *SuperSimpleObjects* and *TeamGradebook* from SVN

# Plan for today

- Introduce how to write your own classes
- Talk about object references and box and pointer diagrams
- Get started on TeamGradebook, your new assignment

# Identifiers (Names) in Java

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

- The conventions:
  - `variableNamesLikeThis`
  - `methodNamesLikeThis(…)`
  - `ClassNamesLikeThis`
- You should follow the conventions!

# Using Objects and Methods

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

"Who does what, with what?"

*Implicit* argument

*Explicit* arguments

The dot notation is also used for *fields*

- Java Example:

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

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

# Class – What, When, Why, & How?

What:

- A blueprint for a custom **type**

When:

- Define a class when you're representing a concept (think nouns)
- When no other existing type can do what you want/need

# Class – What, When, Why, & How?

Why:

- Keep similar concepts together
- Encapsulation (we'll get there in a bit)

How:

```
public class ClassName {
        //fields
        //methods
}
```

# Constructors – What, When, Why, How?

What:

- Special method called when a new instance of a class is created
- Initializes the new instance
- Like the __init__ method in Python

When:

- Define a constructor when special initialization of a class is required
- Otherwise, Java implicitly creates a no-argument constructor if you don’t add one

# Constructors – What, When, Why, How?

Why:

- Allows you to ensure that a new instance of a class is a setup exactly how it needs to be before use of other methods/fields
- Puts it in a good state

How:

```
public class MyClass {
        public MyClass() {
                //initialization code
        }
        public MyClass(ParamType paramName) {
                //initialization code
        }
}
```

# **new** Keyword– What, When, Why, How?

What:

- Used to create a new instance of a class
- Calls the constructor in the class

When:

- Creating a new instance of a class
  - If the class definition is the blueprint for the house, a house that has been built is the “new instance” of the blueprint.

# **new** Keyword– What, When, Why, How?

Why:

- To make a new instance

How:

- MyClass instance = new MyClass();
  - This will call the constructor with the matching parameters in MyClass
- Also used for arrays (as we've seen before):
  - int[] arr = new int[5];

# Implementing classes

- Live coding with Bank Account object
- Public/Private
- Static

# Now code the StudentAssignments class yourself

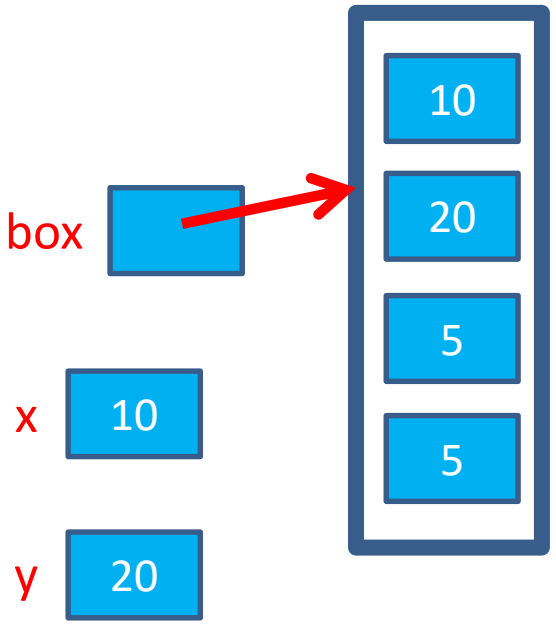
- Uncomment the stuff in StudentAssignmentsMain to see what the class ought to do
- Then create the class and add the constructors and methods you need
- If you finish early, add a function to compute the student's average grade

Differences between primitive types and object types in Java

# OBJECT REFERENCES

# What Do Variables Really Store?

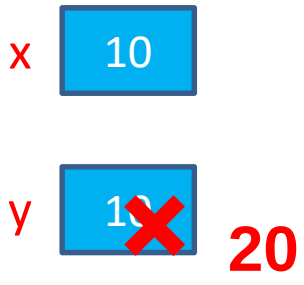
- Variables of primitive type store *values*
- Variables of class type store *references*

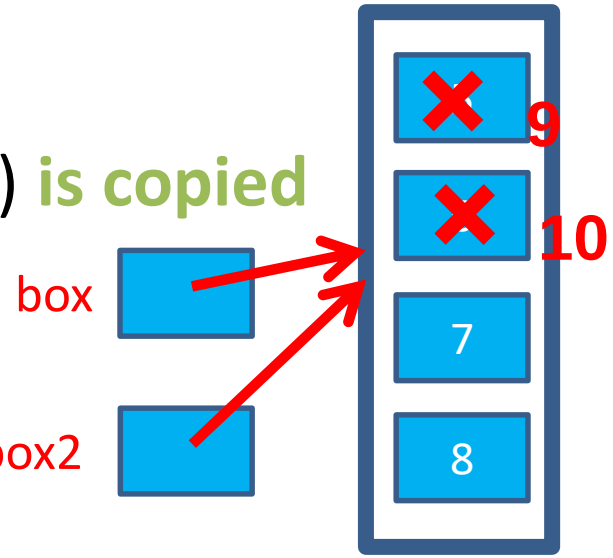



```
1. int x = 10;
2. int y = 20;
3. Rectangle box = new Rectangle(x, y, 5, 5);
```

# Assignment Copies Values

- Actual value for number types
- **Reference** value for object types
  - The actual **object is not copied**
  - The **reference value** ("the pointer") **is copied**
- Consider:




```
1. int x = 10;
2. int y = x;
3. y = 20;

4. Rectangle box = new Rectangle(5, 6, 7, 8);
5. Rectangle box2 = box;
6. box2.translate(4, 4);
```

# Boxes and lines exercise

Q1 – Q10

Separating implementation details from how an object is used

# ENCAPSULATION

# Encapsulation in Object-Oriented Software

- *Encapsulation*—separating implementation details from how an object is used
  - Client code sees a *black box* with a known *interface*

| | Functions | Objects |
|---|---|---|
| **Black box exposes** | Function signature | Constructor and method signatures |
| **Encapsulated inside the box** | Operation implementation | **Data storage** and **operation implementation** |

# Start on TeamGradebook

- Try to finish the code for both add-student and get-names today
- If you are confused about what to do, get help!

Q11