More Classes

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Announcements

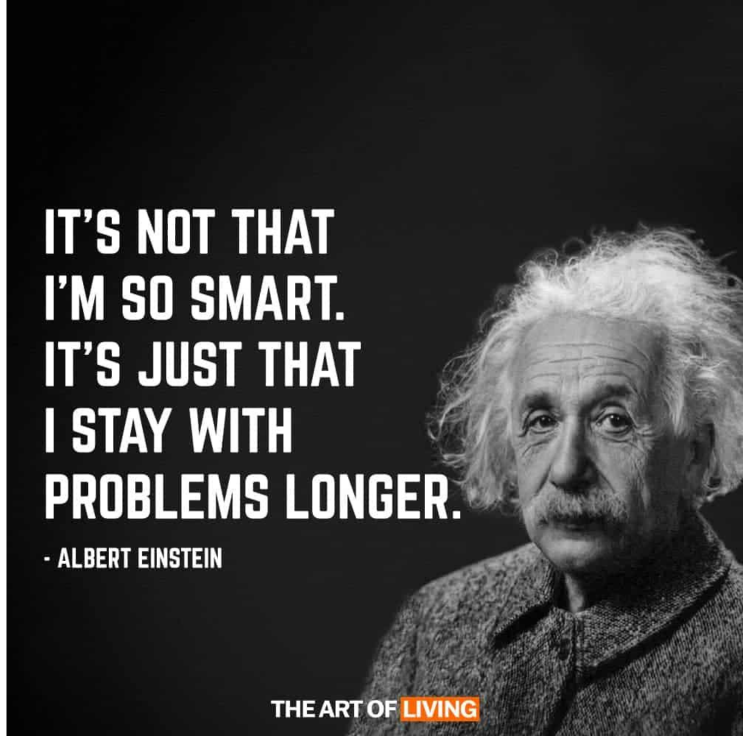
TODO Reminders:

Readings are due **before** lecture

- Reading 17 (zybooks) – you should have already done that ☺
- Lab 11
- Reading 18 (zyBooks) – you should have already done that ☺
- Lab 12
- Reading 19 (zybooks) – you should have already done that ☺

- RPA 9

Keep practicing your RPAs in a spaced and mixed manner ☺


IT'S NOT THAT I'M SO SMART. IT'S JUST THAT I STAY WITH PROBLEMS LONGER.
- ALBERT EINSTEIN
THE ART OF LIVING

https://theartofliving.com/growth-mindset-quotes/

Friday Help Desk – 12-4pm CSB120

Friday Help Session – 1-2pm Teams

Saturday Help Desk – 12-4pm Teams

Sunday Help Desk – 3-7pm Teams

Recall Activity

- Analyze the class Cake presented and write all concepts and ideas you can remember regarding what is a class and how we can define and use it.
- Make a comment line by line.

```
public class Cake {
    public static final boolean IS_GOOD = true;
    private String name;
    private double cost;

    public void setName(String str) {
        name = str;
    }
    public String getName() {
        return name;
    }
    public void setCost(double cost) {
        this.cost = cost;
    }
    public double getCost() {
        return this.cost;
    }
    public Cake(){
        this(“”, 0);
    }
    public Cake(String name, double cost) {
       setName(name);
       setCost(cost);
    }
}
```

Review

- Classes are:
  - Recipes
  - Types (ways to create them)
  - Objects
  - Foundation of Object Oriented Programming
- Classes have:
  - variables
  - methods
  - constructors
- Variables and Methods have:
  - scope
    - Who can access them
  - Memory Type
    - static or instance

```
public class Cake {
    public static final boolean IS_GOOD = true;
    private String name;
    private double cost;

    public void setName(String str) {
        name = str;
    }
    public String getName() {
        return name;
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    public void setCost(double cost) {
        this.cost = cost;
    }
    public double getCost() {
        return this.cost;
    }
    public Cake(){
        this(“”, 0);
    }
    public Cake(String name, double cost) {
       setName(name);
       setCost(cost);
    }
}
```

Static x Instance Variables

- Static
  - Belongs to the class
  - How do you access a public static variable outside of the class?
    - NameClass.nameStaticVariable
  - Example
    - Cake.IS_GOOD
- Instance
  - Belongs to the object
  - How do you access a private instance variable?
    - You will need to have a get method for each variable that you want to have access from other class
    - nameObject.getNameVariable()
  - Example
    - Cake cake1 = new Cake("chocolate", 3.50);
    - System.out.println(cake1.getName());

```
public class Cake {
    public static final boolean IS_GOOD = true;
    private String name;
    private double cost;

    public void setName(String str) {
        name = str;
    }
    public String getName() {
        return name;
    }
    public void setCost(double cost) {
        this.cost = cost;
    }
    public double getCost() {
        return this.cost;
    }
    public Cake(){
        this("", 0);
    }
    public Cake(String name, double cost) {
       setName(name);
       setCost(cost);
    }
}
```

Checking your Understanding (Part 1)

- Identify:
  - Class variables (scope and type)
  - Instance variables (scope and type)
- What is the purpose of the class variable in this example?
- How can we access the class variable from another class?
- How can we access the instance variable from another class?

```
public class Store {

   public static int nextId = 101;


   private String name;
   private String type;
   private int id;

   public Store(String storeName, String storeType) {
      name = storeName;
      type = storeType;
      id = nextId;

      ++nextId;
   }

   public int getId(){
      return id;
  }
}
```

Static Methods

- instance methods
  - Methods that need class level information
  - **`Box bx = new Box(10, 10, 10);`**
  - **`bx.getVolume()`**
    - Uses the Box's width, height, length
    - is called on the constructed object
- static method
  - Methods that "self contained"
  - Matches the *concept* of a class, but not unique to object
  - **Box.calcVolume(10, 10, 10);**
    - one-time use
    - Just does 'one thing' and done
  - static may not call instance methods without building an object
    - but instance can call static!

```java
public class Box {
    private int width;
    private int height;
    private int length;

    public int getVolume() {
        return width * height * length;
    }

    public Box(int width, int height, int length) {
        this.width = width;
        this.height = height;
        this.length = length;
    }

    public static int calcVolume(int w, int h, int l) {
        return w * h * l;
    }
}
```

Overloaded Constructors

- Just like methods
  - Constructors can be overloaded.
- Standard practice
  - call the most specific constructor with default values
  - this() (notice parents) is used to call the constructor.
  - must be **first line** in the constructor.
  - Keep it DRY!
- When you write a constructor with parameters, the default one is not supported anymore!
  - Box b1 = new Box(); --- Error!
- Really ask yourself
  - What do you need
  - Where do you get it!

```
public class Box {
/* … */
    public Box(int cubeSize) {
    // A one parameter constructor that sends default
    // values to the largest
        this(cubeSize, cubeSize, cubeSize);
    }
    public Box(int width, int height, int length) {
        this.width = width;
        this.height = height;
        this.length = length;
    }
    public static void main(String[] args) {
        Box rec = new Box(10, 20, 10);
        Box cube = new Box(10);
    }
}
```

Checking your Understanding (Part 2)

- Rewrite the class Pet to have its constructors properly overloaded.

```
public class Pet {
   private String name;
   private int age;

   public Pet() {
      name = "Unnamed";
      age = -1;
   }

   public Pet(String petName, int yearsOld) {
      name = petName;
      age = yearsOld;
   }

   public String toString() {
      return name + ", " + age;
   }
}
```

Packages

- Is a grouping of related types, classes, interfaces, and subpackage
- Use "import" to add those packages to your program
- java.lang is automatically imported in all Java programs
- import java.io.File; versus import java.io.*;

Package	Sample package members	Description
java.lang	String, Integer, Double, Math	Contains fundamental Java classes. Automatically imported by Java.
java.util	Collection, ArrayList, LinkedList, Scanner	Contains the Java collections framework classes and miscellaneous utility classes.
java.io	File, InputStream, OutputStream	Contains classes for system input and output.
javax.swing	JFrame, JTextField, JButton	Contains classes for building graphical user interfaces.

Unit Testing

- a program whose job is to thoroughly test another program (or portion) via a series of input/output checks known as test cases
- Example: FileTester.java class available in Lab 11!
- https://github.com/CSU-CompSci-CS163-4/Lab11FileOutput/blob/main/src/FileTester.java