

# Classes

## Classes

Classes are a way to encapsulate data and the methods that operate on them. We've used lots of classes so far such as `Scanner` and `Random`.

All of our programs we've created in the labs are also their own class.

```
public class Hello
{
    public static void main(String[] args)
    {
        System.out.println("Hello, World!");
    }
}
```

## Classes

A class is a **blueprint** for making an object. When we used classes such as `Random` and `Scanner`, we used the `new` keyword in order to instantiate an object.

```
Random rand = new Random();
```

```
Scanner scan = new Scanner();
```



Chocolate Cake		
Single	Double	Triple
2 1/2 oz Dutch Cocoa Powder	4.5 oz Dutch Cocoa Powder	6.25 oz Dutch Cocoa Powder
8.25 oz Boiling Water	1 Lb 1 oz Boiling Water	1 Lb 9 oz Boiling Water
3 Large Eggs	6 Large Eggs	9 Large Eggs
2 Teaspoon Vanilla	1 Tablespoon 1 Teaspoon Vanilla	2 Tablespoon Vanilla
2 oz Vegetable Oil	4 oz Vegetable Oil	6 oz Vegetable Oil
8.25 oz Cake Flour	1 Bt 1 oz Cake Flour	1 Bt 10 oz Cake Flour
10.5 oz Granulated Sugar	1 Pound 5 oz Granulated Sugar	1 Pound 15 oz Granulated Sugar
1 Tablespoon Baking Powder	2 Tablespoon Baking Powder	3 Tablespoon Baking Powder
3/4 Teaspoon salt	1.5 Teaspoon salt	2 Teaspoon Salt
8 oz Unsalted Butter	16 oz Unsalted Butter	16 to 8 oz Unsalted Butter

**Method**

Combine dry ingredients in mixing bowl. Add butter in small chunks and mix with paddle until crumbly. Combine wet ingredients for chocolate, combine boiling water and cocoa powder and salt, let cool butter adding to wet ingredients. Whisk together with eggs.

Add 1/4 of wet ingredients to dry until moistened, increase speed to medium high and mix until light and fluffy and lighter in color. Add half of remaining wet ingredients and continue mixing on low. Scrape bowl. Add remaining wet ingredients and mix until combined.

Bake at 325 in a floured pan

```
ChocolateCake cake = new ChocolateCake();
```

## Classes

The names of classes have **EachWordCapitalized**. The name of the file you create needs to be the same name as your class.

```
// ChocolateCake.java
```

```
public class ChocolateCake {  
  
}
```

## Classes - properties

The variables contained inside a class are called: **properties**.

```
// ChocolateCake.java

public class ChocolateCake {
    public String cakeType;
    public boolean isFrosted;
    public double price;
}
```

## Classes - properties

The functions contained inside a class are called: **methods**.

```
// ChocolateCake.java

public class ChocolateCake {

    public void print() {
        System.out.println("A lovely cake!");
    }

}
```

## Classes

Here are the **properties** and **method** together. You'll notice everything is marked with **public**. This makes the properties and methods available.

```
public class ChocolateCake {  
    public String cakeType;  
    public boolean isFrosted;  
    public double price;  
  
    public void print() {  
        System.out.println("A lovely " + cakeType + " cake!");  
        if (isFrosted) {  
            System.out.println("It's also frosted!");  
        }  
        System.out.printf("Just $%.2f\n", price);  
    }  
}
```

## Classes

Here is how we would use our ChocolateCake class as it is so far.

```
ChocolateCake cake = new ChocolateCake();
```

```
cake.flavor = "Flourless";
```

```
cake.isFrosted = true;
```

```
cake.price = 20.00;
```

```
cake.print();
```

---

```
A lovely Flourless cake!
```

```
It's also frosted!
```

```
Just $20.00
```



## Classes

You can use the `private` keyword to make properties and methods of your class not accessible to other programmers or to prevent accidental changes.

```
public class Grader {  
    private double total;  
  
    public void addScore(double score) {  
        total = total + score;  
    }  
  
    public void print() {  
        System.out.printf("Total score $%.2f\n", total);  
    }  
}
```

# Demo

Don't Forget!

Check the syllabus / schedule for reading assignments and due dates!

# Class Initialization

## Class Initialization - Properties

You can initialize the properties in your class. When you make a call to `new` these are set automatically.

```
public class Student {  
    public String name = "(unknown)";  
    private double total = 0.0;  
}
```

---

```
Student s = new Student();  
System.out.println(s.name);
```

---

(unknown)

## Class Initialization - Constructor

A constructor is a special method with the same name as your class. It is run when your class is instantiated. You can have no parameters such as: `new Random()` or you may pass in any number of parameters such as `new Scanner(System.in)`

```
public class Student {  
    public String name;  
  
    public Student() {  
        name = "(unknown)";  
    }  
}
```

---

```
Student s = new Student();  
System.out.println(s.name);
```

---

(unknown)

## Class Initialization - Constructor

You can **overload** the constructor - have multiple versions based on what parameters are passed to it.

```
public class Student {  
    public String name;  
  
    public Student() {  
        name = "(unknown)";  
    }  
  
    public Student(String n) {  
        name = n;  
    }  
}
```

```
Student s1 = new Student();  
System.out.println(s1.name);
```

```
Student s2 = new Student("Harry");  
System.out.println(s2.name);
```

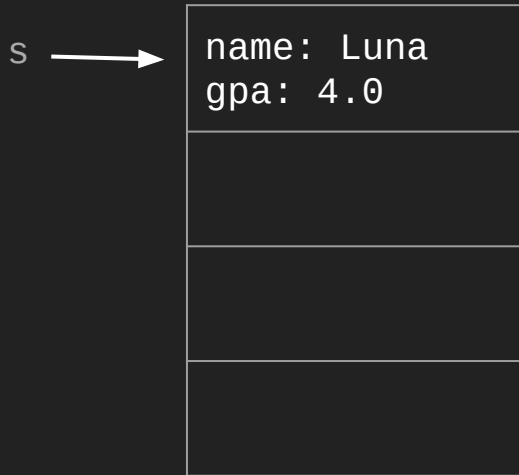
```
(unknown)  
Harry
```

# References

## References

When you instantiate a class, the variable is a pointer to a location in memory.

```
Student s = new Student("Luna");
```



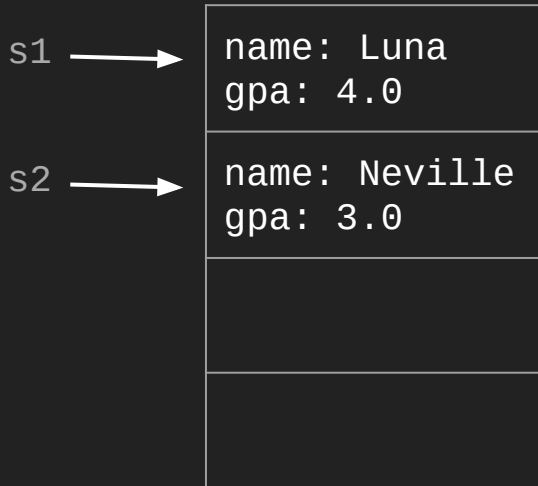
Memory



## References

Two variables that both use `new`, will point to different locations in memory.

```
Student s1 = new Student("Luna");  
Student s2 = new Student("Neville");
```



Memory

## References

What's going to happen here?

```
Student s1 = new Student("Luna");  
Student s2 = new Student("Neville");  
  
s2 = s1;  
  
s2.name = "Draco";  
  
System.out.println(s1.name);
```

## References

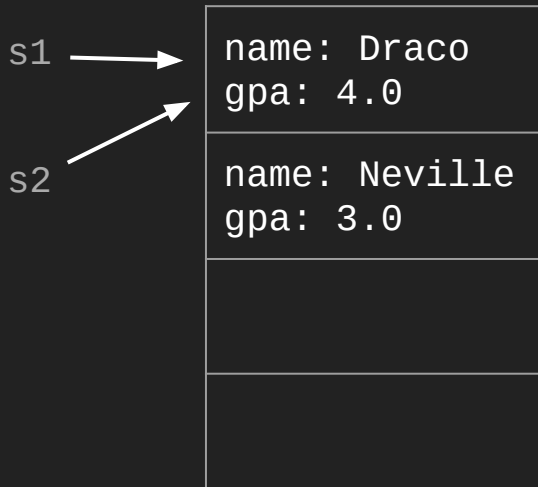
Although there will be a place in memory where Neville was, s2 will now point to the same location in memory as s1

```
Student s1 = new Student("Luna");  
Student s2 = new Student("Neville");
```

```
s2 = s1;
```

```
s2.name = "Draco";
```

```
System.out.println(s1.name);
```



Memory

---

Draco

## Class, Instantiate, Object, Reference

class	<ul style="list-style-type: none"><li>- Your definition / blueprint / recipe</li><li>- (blueprint for a house)</li></ul>
instantiate	<ul style="list-style-type: none"><li>- The act of <b>allocating memory</b> to store a copy of the class "new"</li><li>- (construct the house)</li></ul>
object	<ul style="list-style-type: none"><li>- The <b>instance</b> of the class (what you interact with)</li><li>- (the actual house)</li></ul>
reference	<ul style="list-style-type: none"><li>- The variable that <b>points</b> to the memory with there object is.</li><li>- (the address of the house)</li></ul>

# Let's Code

Don't Forget!

Check the syllabus / schedule for reading assignments and **due dates!**