Abstract Classes & Interfaces

Learning Objectives

- Learn and use **Java Abstraction**
- Learn and use **Java Interface**

Agenda

Do Now

Mini Lesson:

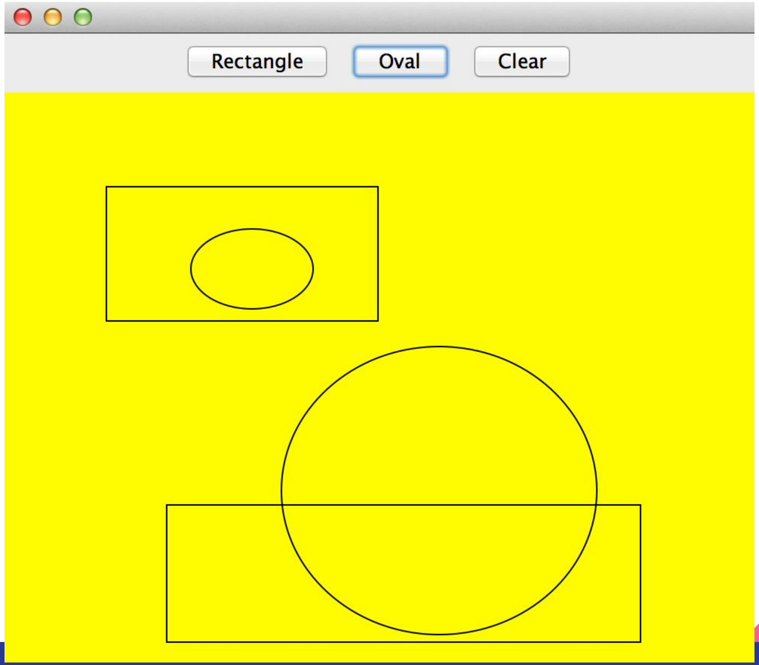
- Abstract Classes
- Interfaces

Practice - Questions

Exit-Ticket

Do Now

If you were creating a program to allow users to draw rectangles and ovals by clicking the mouse at a location and then dragging and releasing to define the width, what classes would you need?

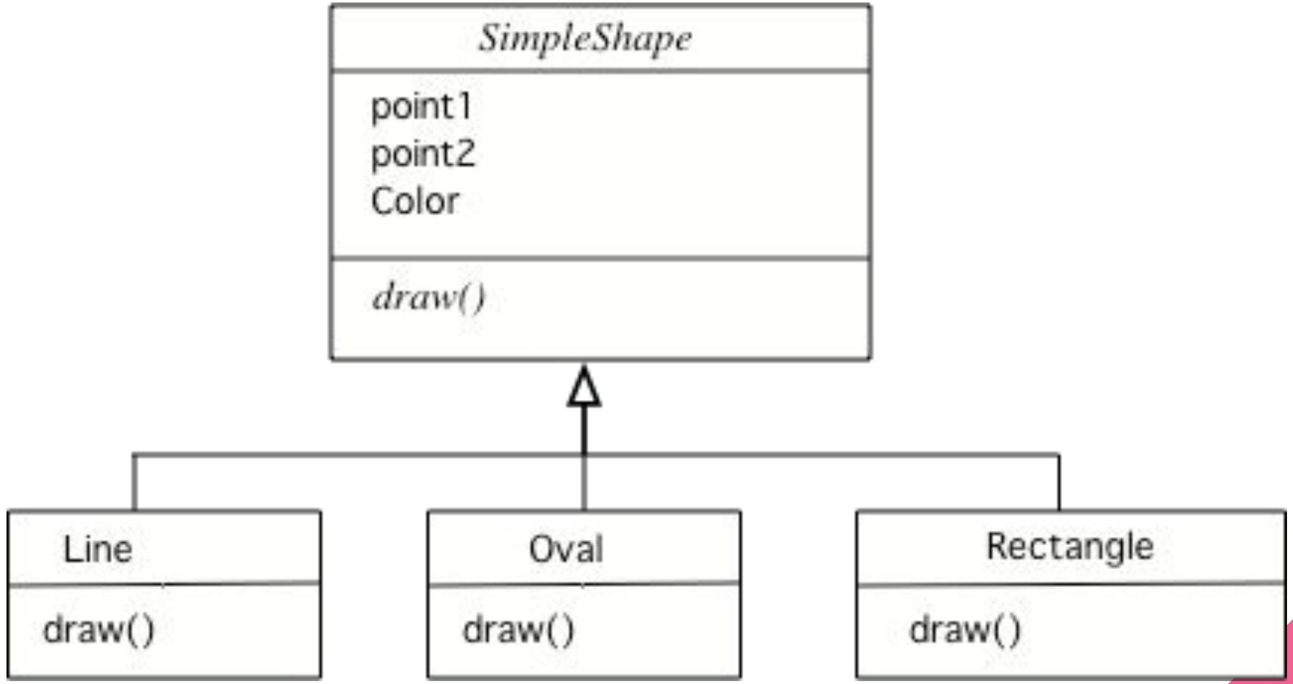


Possible Solution

- Create two classes: Rectangle and Oval
- These two classes are shapes that can be defined by two points. Can we create a Shape class to define those two points and add other shape attributes like color for example? What would it look like? How would you draw the shapes? Where the drawing methods should be implemented?

Yes, we can have a Shape object, but we don't know what Shape looks like we can make the class abstract which means you cannot create any objects of that type.

Abstraction



Abstraction

Data **abstraction** is the process of hiding certain details and showing only essential information to the user.

Abstraction can be achieved with **abstract classes** or **interfaces**.

Abstraction

The **abstract keyword** is a non-access modifier, used for classes and methods:

- **Abstract class (restricted class)**

  Cannot be used to create objects

  Must be inherited from another class

- **Abstract method**

  Can only be used in an abstract class

  Does not have a body. The body is provided by the subclass (inherited from).

Example

```
abstract class Animal {
  public abstract void animalSound();
  public void sleep() {
    System.out.println("Zzz");
 }
}
```

```
Animal myAnimal = new Animal();

// will generate an error
```

$\longrightarrow$ ERROR

```java
// Abstract class
abstract class Animal {
  // Abstract method
  //(does not have a body)
  public abstract void animalSound();
  // Regular method
  public void sleep() {
    System.out.println("Zzz");
  }
}
```

```java
// Subclass (inherit from Animal)
class Dog extends Animal {
  public void animalSound() {
    // The body of animalSound() is provided here
    System.out.println("The dog says: woof woof");
  }
}
```

```java
class Driver {
  public static void main(String[] args) {
    Dog myDog = new Dog(); // Create a Dog object
    myDog.animalSound();
    myDog.sleep();
  }
}
```

Interfaces

An **interface** is a completely "abstract class" that is used to group related methods with empty bodies:

```
// interface
interface Animal {
  public void animalSound(); // interface method (does not have a body)
  public void run(); // interface method (does not have a body)

 }
```

To access the interface methods, the interface must be "implemented" by another class with the **implements** keyword (instead of **extends**). The body of the interface method is provided by the "implement" class.

```java
// Interface
interface Animal {
  public void animalSound(); // interface method (does not have a body)
  public void sleep(); // interface method (does not have a body)
}
```

```java
// Dog "implements" the Animal interface
class Dog implements Animal {
  public void animalSound() {
    // The body of animalSound() is provided
here
    System.out.println("The dog says: woof
woof");
  }
  public void sleep() {
    // The body of sleep() is provided here
    System.out.println("Zzz");
  }
}
```

```java
class Main {
  public static void main(String[] args)
{
    // Create a Dog object
    Dog myDog = new Dog();
    myDog.animalSound();
    myDog.sleep();
  }

}
```