Abstract Classes & Interfaces

Learning Objectives

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

Agenda

Do Now

Mini Lesson:

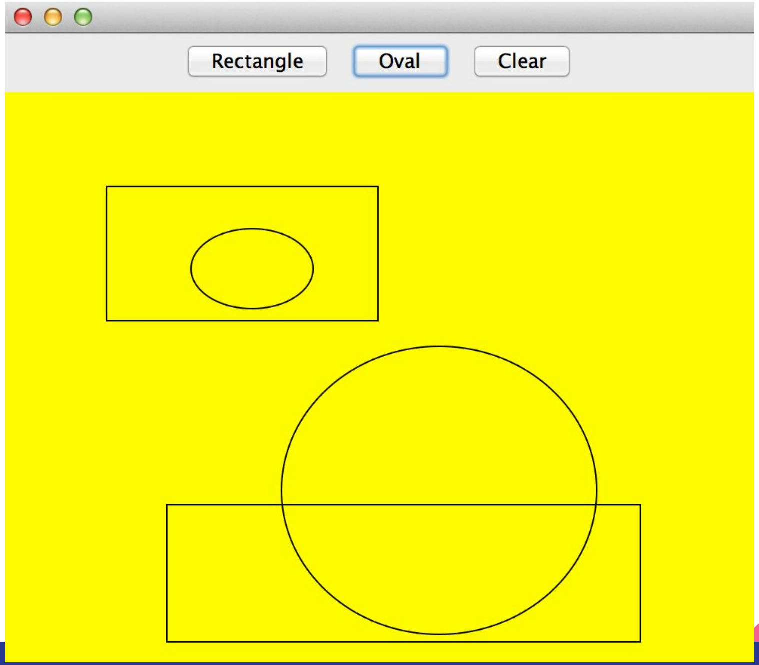
- Abstract Classes
- Interfaces

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?

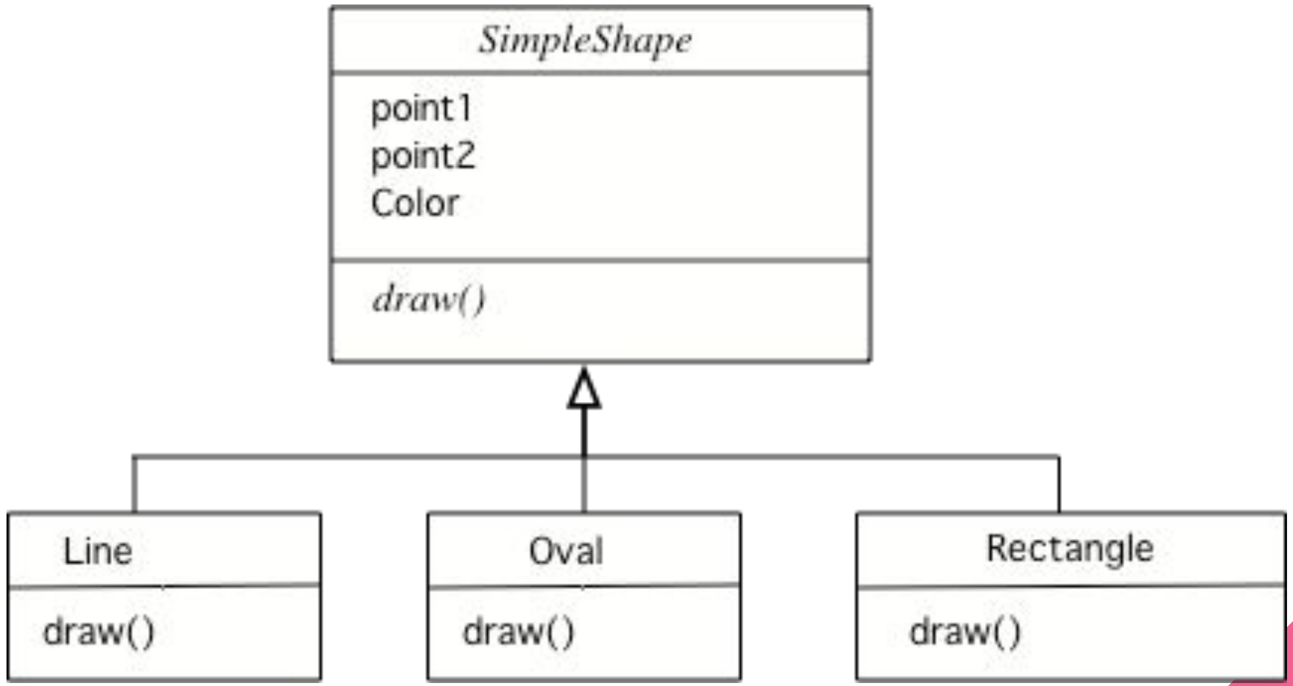


Possible Solution

- 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.

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

```
// 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");
  }
}
```

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

}
```

Summary

Abstract classes and interfaces let you write code today that works with code someone else writes tomorrow.