OO Programming

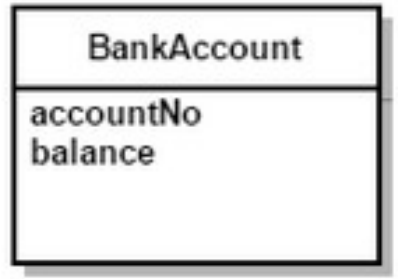
The details of Java

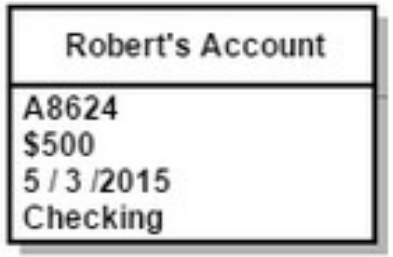
OO Concepts

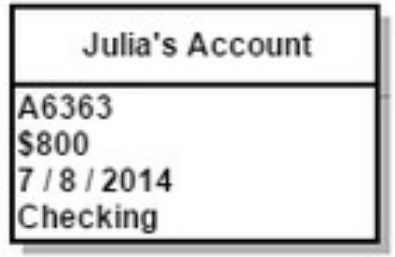
1. **Abstraction**
2. **Encapsulation**
3. **Inheritance**
4. **Polymorphism** and **Dynamic Dispatching**
5. **Runtime vs Compile Time**

Abstraction

Class vs **Instance**
Creating **abstractions** of concepts that we can re-use








```
BankAccount robertsAccount;
BankAccount juliasAccount;
```

Encapsulation (information Hiding)

Hiding parts of a program in order to create a **Standard Interface**

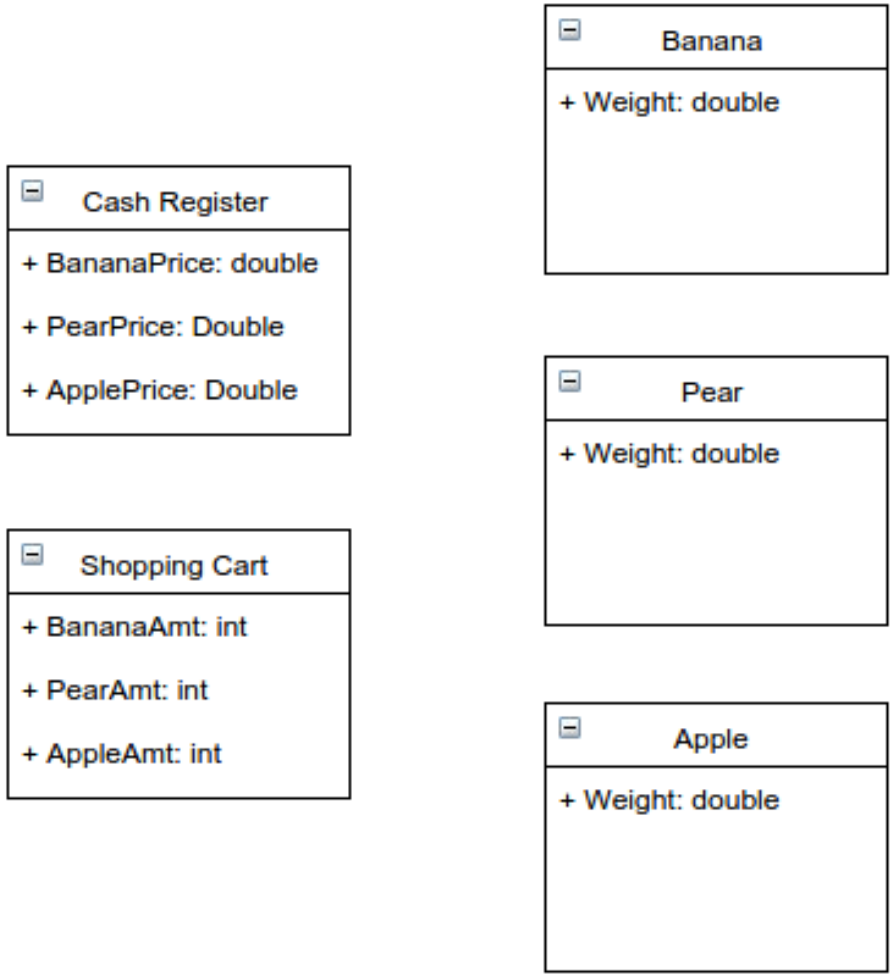
```
public class Employee {
    private BigDecimal salary = new BigDecimal(50000.00);

    public BigDecimal getSalary() {
        return salary;
    }

    public static void main() {
        Employee e = new Employee();
        BigDecimal sal = e.getSalary();
    }
}
```

Encapsulation (information Hiding)

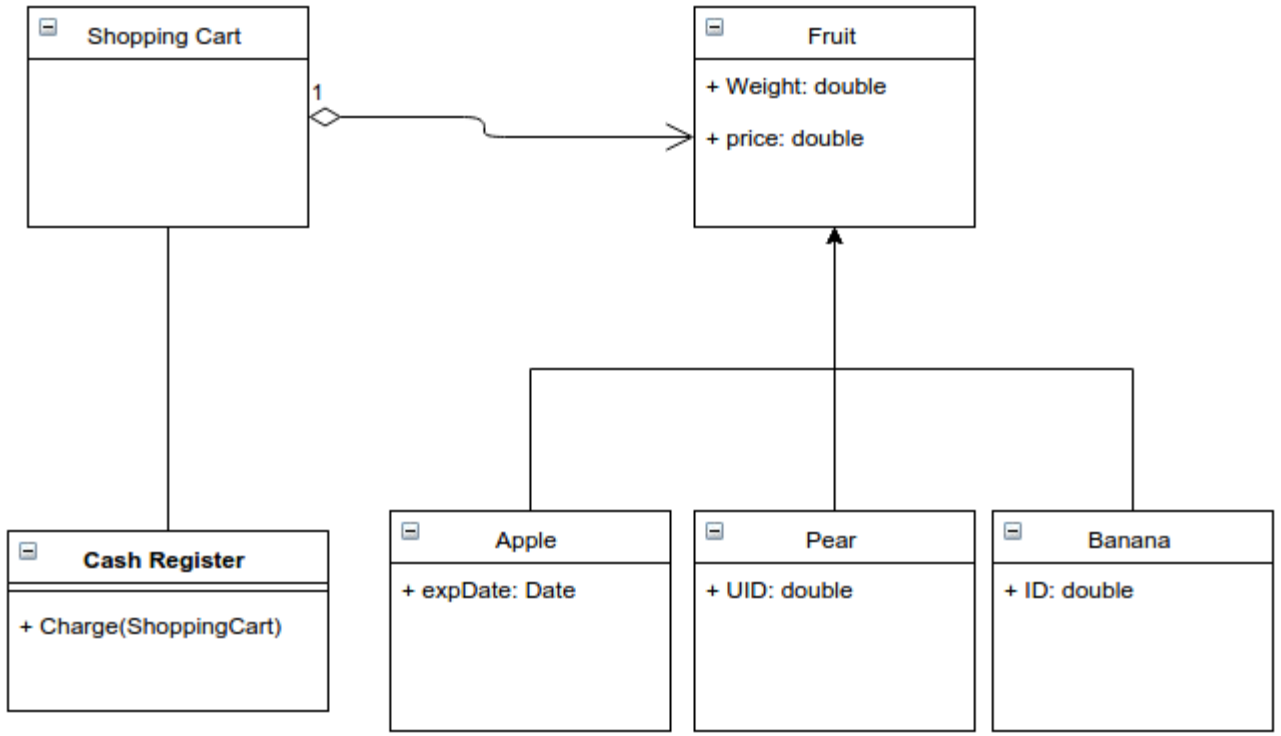
Who should have the **price** attributes?



Encapsulation (information Hiding)

Who should have the **price** attributes?

The information Expert



Inheritance

When to use:
Reusing **attributes** and **Methods**
Creating **abstractions** of concepts

```
class Convertible {
// Key (private)
//  Speed : 155 (miles / hour)
//   Weight 1600 kg
//  Engine : 3.2 L S54 inline-6
}
```

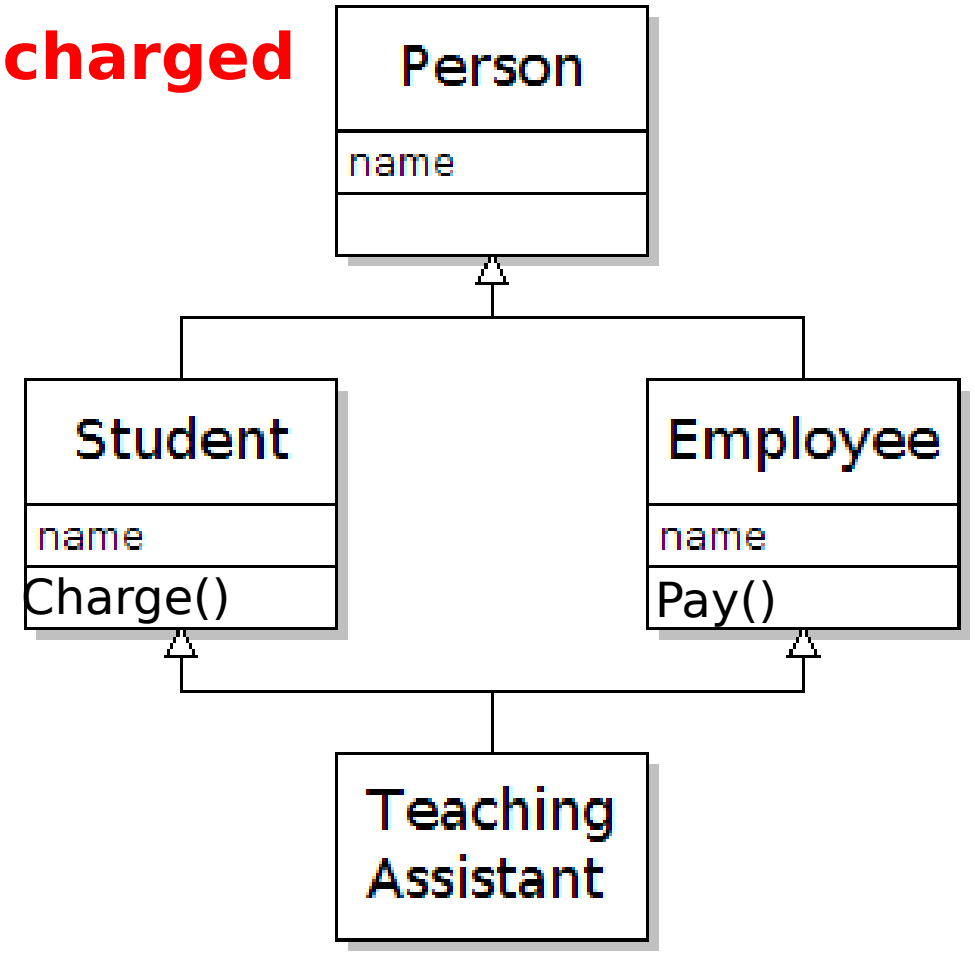
```
class Roadster extends Convertible {

 //  Speed : 165 (miles / hour)
 //  Weight 1399 kg
 }
```

Inheritance Diamond Problem

How can we create a class that can be **charged** and **paid**?

Java will not allow this!



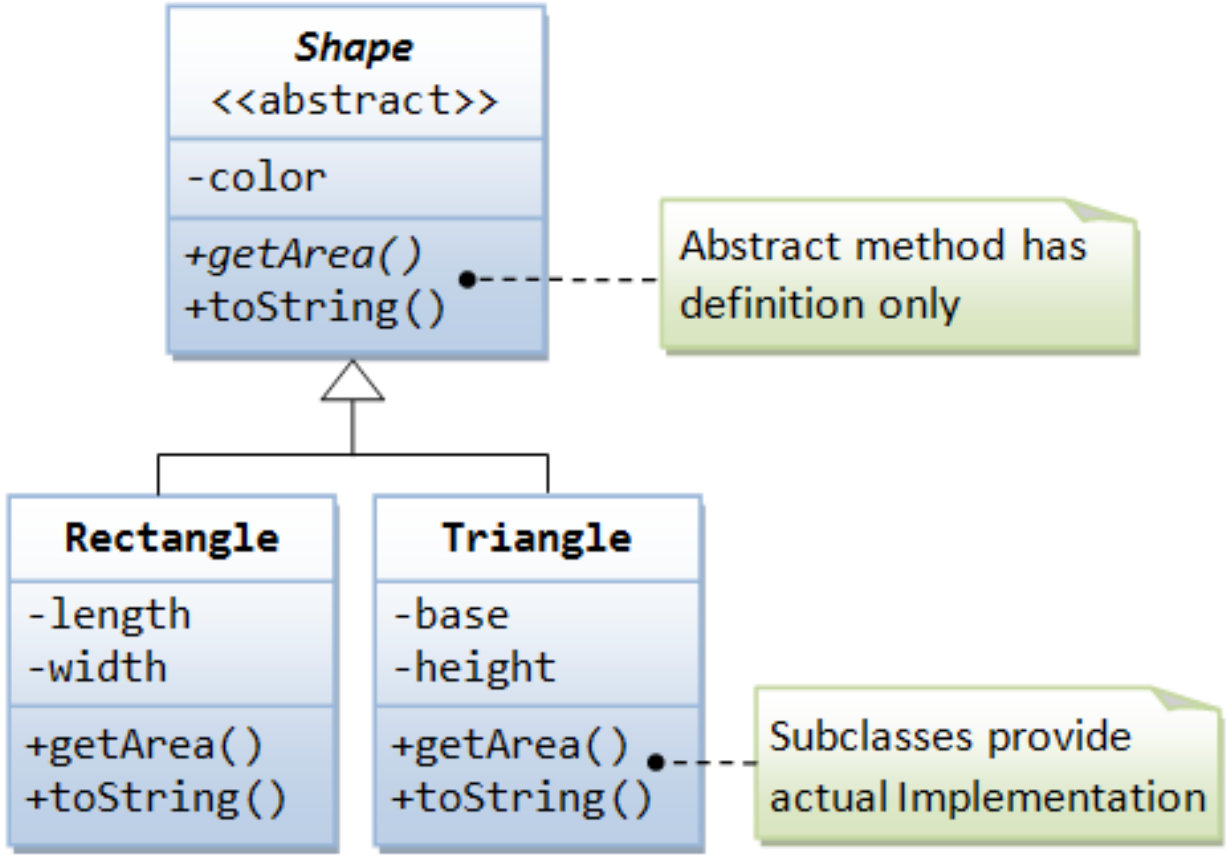
Interfaces

Standardizing a method across multiple classes

Abstract class

Problem: We want to create a super class that can’t be instantiated

Solution: Abstract class



Dynamic Method dispatching

Problem: Want to create multiple enemies with the same interface but have different implementations

Solution: Dynamic method Dispatching

See code example in the repo if you did not attend tutorial.

Runtime vs Compile time

When is **Compile** time? When is **Runtime**? What does it mean?
Mistakes happen when you are:
1.writing code
2.Compiling
3.Executing code

Understanding where in the **cycle** the error happens helps **diagnose** the issue.

- Is there an example?
- **Yes**, see the code on the repo if you did not attend the tutorial

Concept Questions

Will an IDE catch compile time errors?
Will an IDE catch runtime errors?
Is there a difference between an abstract class and an interface?

Deliverables

Software Architecture Document due

References

1.Runtime vs compile time explanation:
https://www.youtube.com/watch?v=QmvmZqpthbc
Dynamic method dispatching: https://www.youtube.com/watch?v=PK2mZ39AAzE
OO blog: https://theleancoder.wordpress.com/2015/10/11/the-four-pillars-of-object-oriented-design/