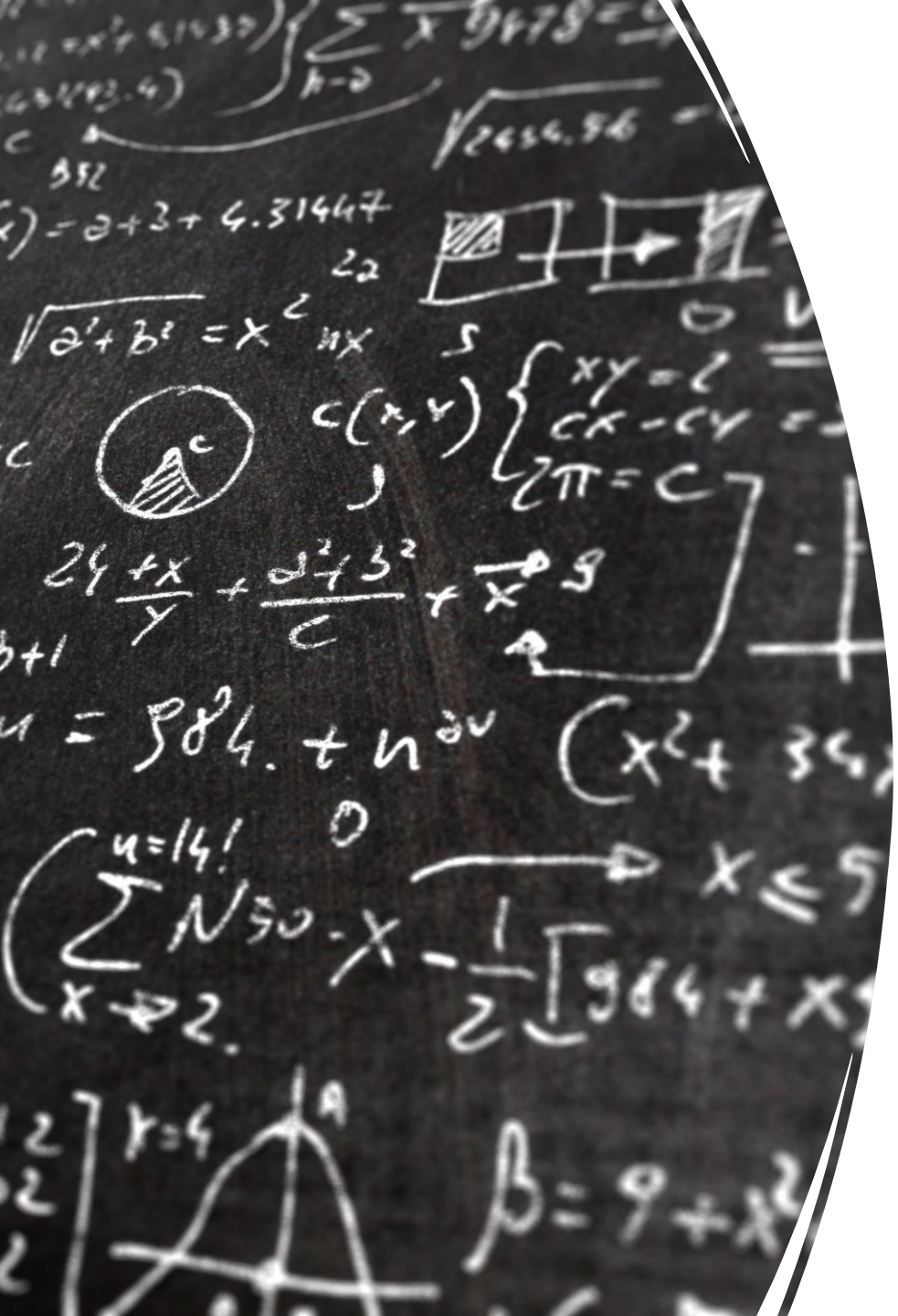


CS 113 – Computer Science I

Lecture 13 – Objects

Adam Poliak

10/27/2022

Announcements

- Assignment 06
  - Due tonight (thursday 10/27)

- Mid-semester feedback

- Pythontutor.com - https://pythontutor.com/java.html

Access modifiers

Specify the access-level of instance variables/methods

- `public`
  - code outside of the class can access the variable/method
- `private`
  - code outside of the class cannot access the variable/method
- `protected`
  - Allow subclasses to accesses data in parent class

Default in java is `public`

Access modifiers

Default in java is `public`

In this class, make instance data private

Class inheritance

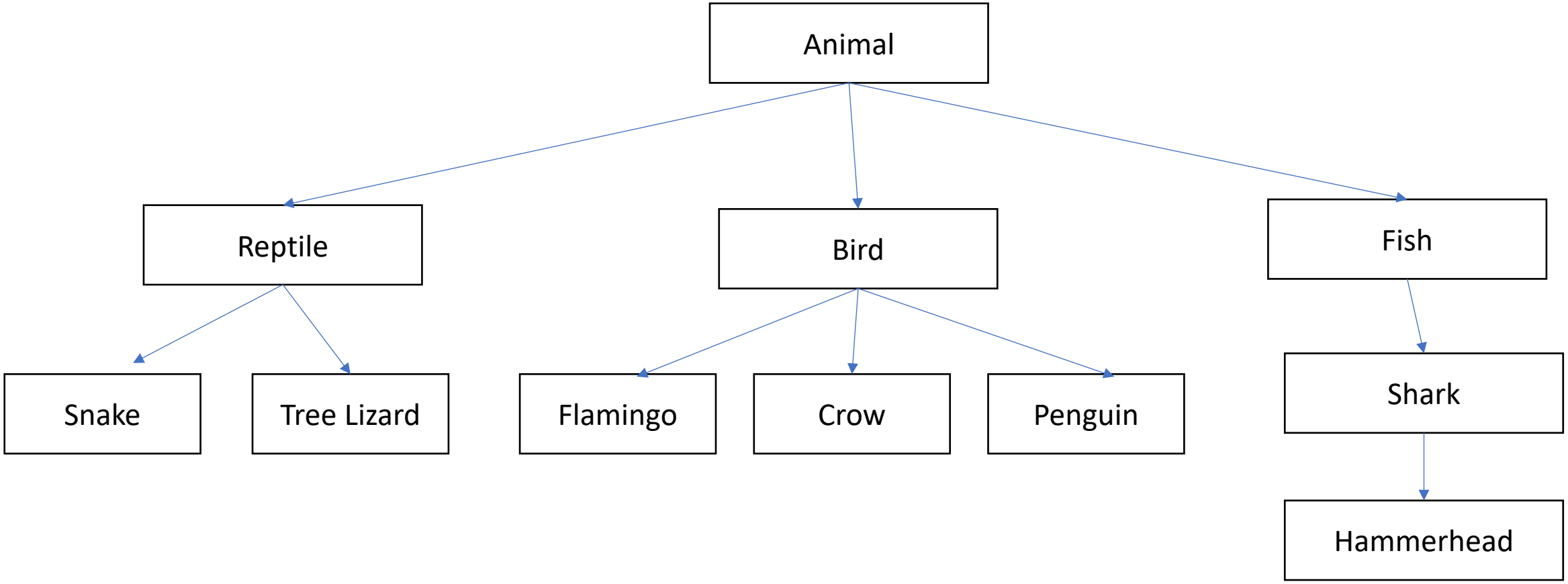
Review:

- Classes are like categories
- Objects are like examples of the categories

Classes can be arranged hierarchically where,

a child class ”inherits” from a parent class

Inheritance: feature for organizing classes into hierarchies



Inheritance: subclasses refine behavior/state

Subclasses can override methods from parent class

Exercise

1. Implement getter functions for instance variables inside Animal

2. In Zoo.java, call the getters and output the values to console

Polymorphism

Program can treat all objects that extend a base class the same

Java automatically calls the specific methods for each subclass

Polymorphism: Demo

```
public class Zoo {
    public static void main(String[] args) {
        Animal animal1 = new Animal();
        animal1.locomote();

        Animal animal2 = new Reptile();
        animal2.locomote();
    }
}
```

```
public class Animal {
    public Animal() {
    }
    public void locomote() {
        System.out.println("I am moving!");
    }
}
```

```
public class Reptile extends Animal {
    public Reptile() {
    }
    public void locomote() {
        System.out.println("I am walking!");
    }
}
```

Exercise: What is the output of this program?

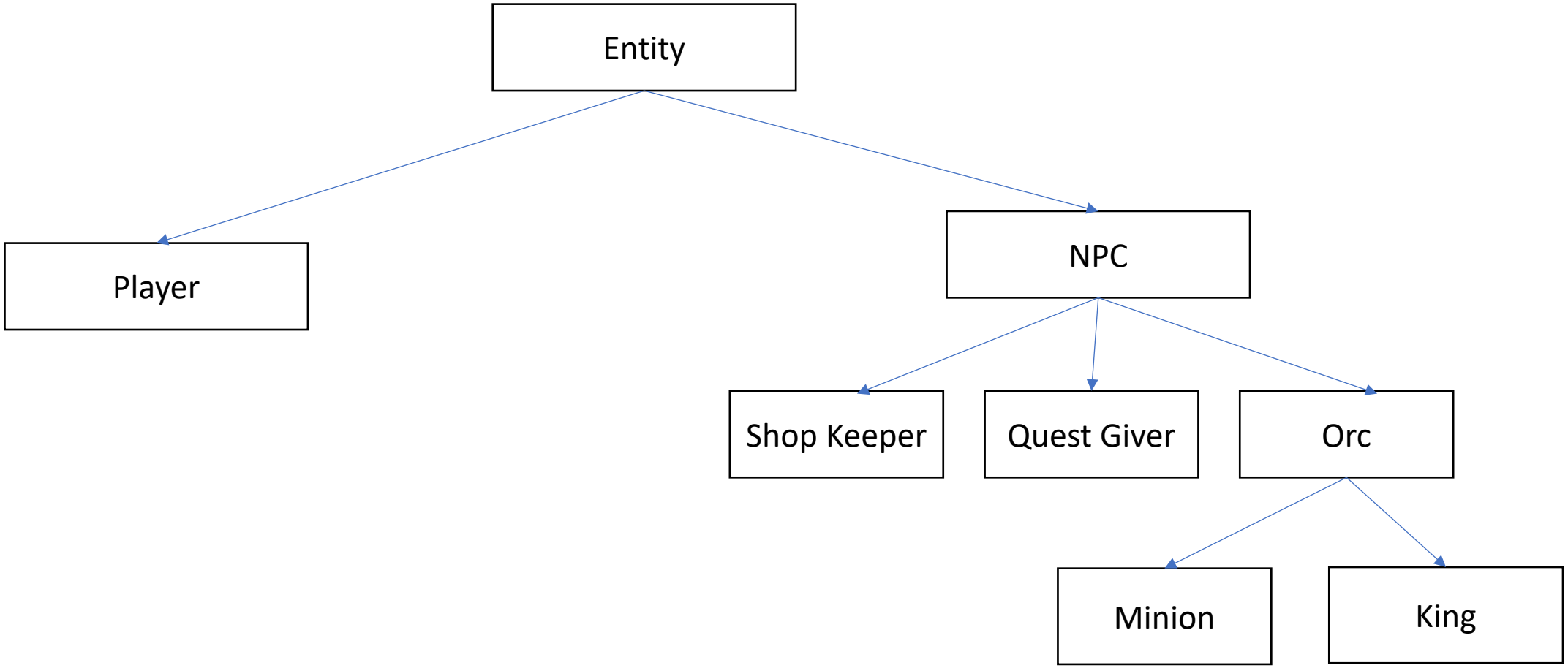
```
public class Zoo {
   public static void main(String[] args) {
      Animal animal1 = new Animal();
      animal1.locomote();

      Animal animal2 = new Fish();
      animal2.locomote();
   }
}
```

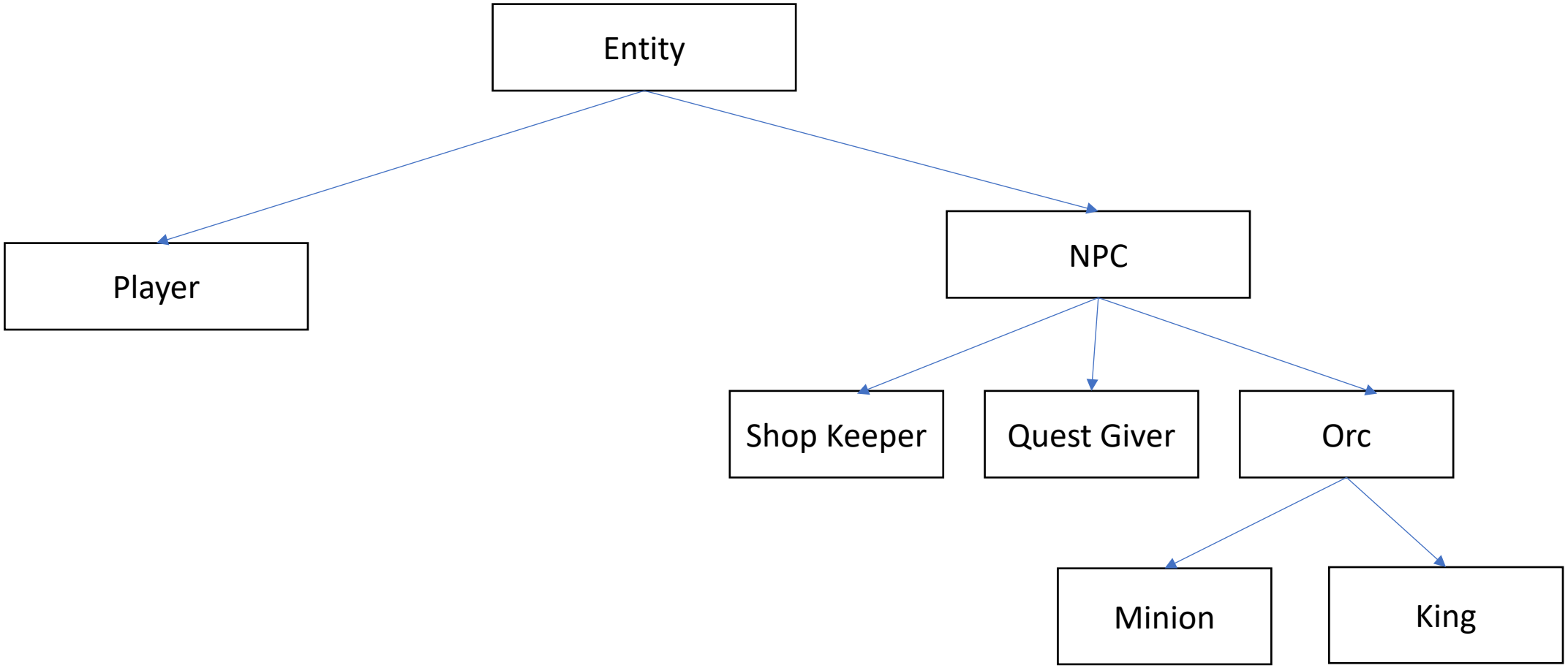
```
public class Animal {
   public Animal() {
   }
   public void locomote() {
      System.out.println("I am moving!");
   }
}
```

```
public class Fish extends Animal {
  public Fish() {
  }
  public void locomote() {
    System.out.println("I am swimming!");
  }
}
```

Question: How would we implement Minion?



Inheritance



Exercise: Implement a Bird animal

OOP Example & Design: Vending machine

OOP Design: Vending machine

Defining the snack class

```
public class Snack {
    private int mQuantity;
    private double mCost;
    private String mName;

    public Snack(String name, int quantity, double cost) {
        mQuantity = quantity;
        mCost = cost;
        mName = name;
    }
    public String getName() {
        return mName;
    }

    public void buy() {
       if (mQuantity > 0) {
           mQuantity--;
       }
    }
}
```

Testing the Snack class

```
public static void main(String args[])
{
    Snack snack = new Snack("Slurm", 10, 1.5);
    System.out.println("Snack: "+snack.getName());
}
```