CSCI 132:
Basic Data Structures and Algorithms

Inheritance

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Inheritance is a mechanism in Java that allows for a class to acquire instance fields and methods from another class

In Java, we use the **`extends`** keyword to indicate that a class is inheriting from another

```
public class Programmer extends Employee {
}
```

The `Programmer` class inherits from the `Employee` class

```java
public class Programmer extends Employee {

private String programming_language;

public Programmer(String name, int id, int salary, String lan) {
        super(name,id,salary);
        this.programming_language = lan;
}

public String getLanguage() {
        return this.programming_language;
}


}
```

Programmer.java

```java
public class Employee {

private String name;
private int emp_id;
private int salary;

public Employee(String name, int id, int salary) {
        this.name = name;
        this.emp_id = id;
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public String getName() {
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Employee.java

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public String getName() {
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}
```

Employee.java

```java
Programmer reese = new Programmer("Reese Pearsall", 1234, 90000, "Python");
System.out.println(reese.getName());
```

`getName()` is not defined in the `Programmer` class, but because the `Programmer` class *inherits* from the `Employee` class, the reese object has access to the **`getName()`** method

```java
public class Programmer extends Employee {

private String programming_language;

public Programmer(String name, int id, int salary, String lan) {
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}
```

Programmer.java

```java
public class Employee {

private String name;
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public String getName() {
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}
```

Employee.java

Inherited!

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        this.name = name;
        this.emp_id = id;
        this.salary = salary;
}

public String getName() {
        return this.name;
}
```

Employee.java

Not inherited! (but the getter methods are)

`private` instance fields and methods are **not** inherited

```java
public class Programmer extends Employee {

private String programming_language;

public Programmer(String name, int id, int salary, String lan) {
        super(name,id,salary);
        this.programming_language = lan;
}

public String getLanguage() {
        return this.programming_language;
}


}
```

Programmer.java

```java
public class Employee {

protected String name;
protected int emp_id;
protected int salary;

public Employee(String name, int id, int salary) {
        this.name = name;
        this.emp_id = id;
        this.salary = salary;
}

public String getName() {
        return this.name;
}
```

Employee.java

Now this instance fields will be inherited ☺

`private` instance fields and methods are **not** inherited

We can make instance fields `protected`, which means they are still private to other classes, but now they can be inherited

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private String programming_language;

public Programmer(String name, int id, int salary, String lan) {
        super(name,id,salary);
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public String getLanguage() {
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}
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Programmer.java

```java
public class Employee {

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public Employee(String name, int id, int salary) {
        this.name = name;
        this.emp_id = id;
        this.salary = salary;
}

public String getName() {
        return this.name;
}
```
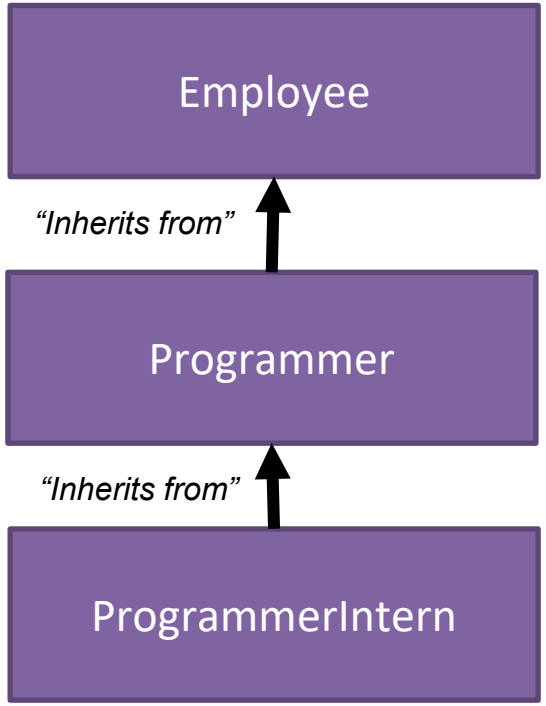

Employee.java

The `super` keyword is used to reference the parent class. Just using `super()` will call the parent constructor

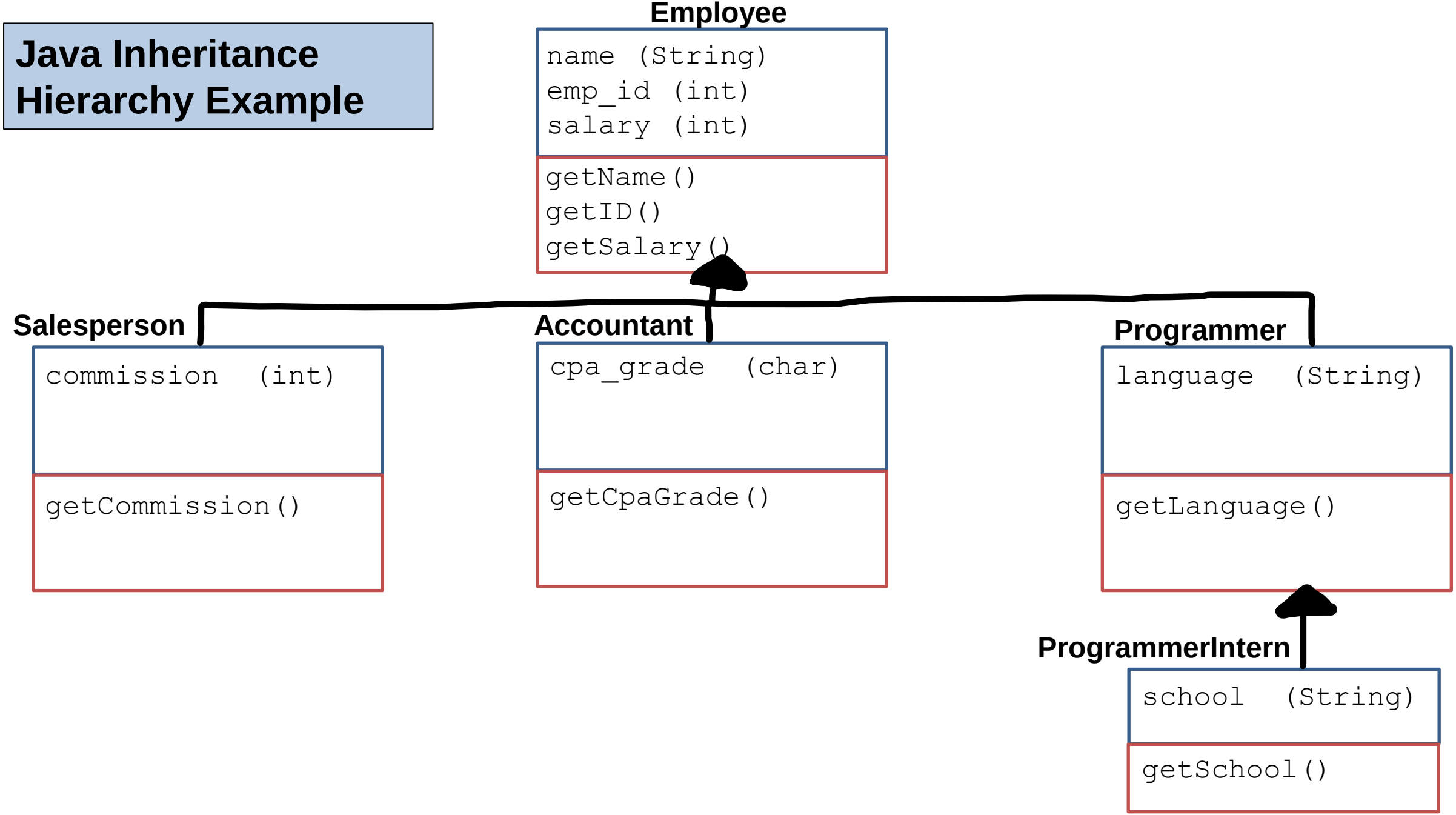
```java
public class Employee {

}

public class Programmer extends Employee {

}


public class ProgrammerIntern extends Programmer{
}
```



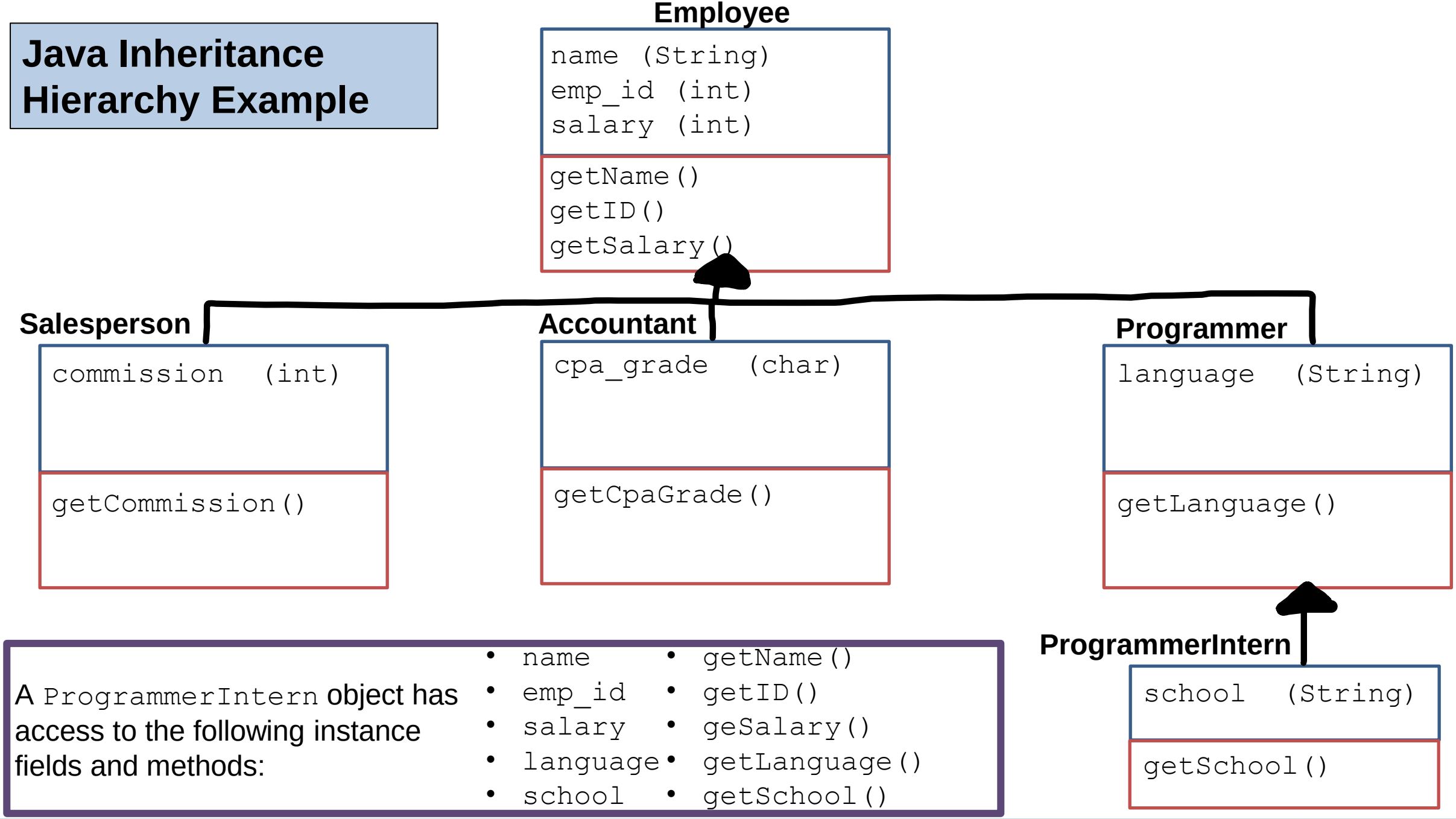
In Java, we can only inherit from *one* class (but that one class we inherit from can also inherit from another class)

In this example, `ProgrammerIntern` indirectly has access to the `Employee` class instance fields/methods because the `Programmer` class inherits from `Employee`

Java Inheritance Hierarchy Example



Java Inheritance Hierarchy Example



A `ProgrammerIntern` object has access to the following instance fields and methods:

- `name`
- `emp_id`
- `salary`
- `language`
- `school`
- `getName()`
- `getID()`
- `geSalary()`
- `getLanguage()`
- `getSchool()`

(and also the local + parent constructor method)

Method Precedence

Employee.java

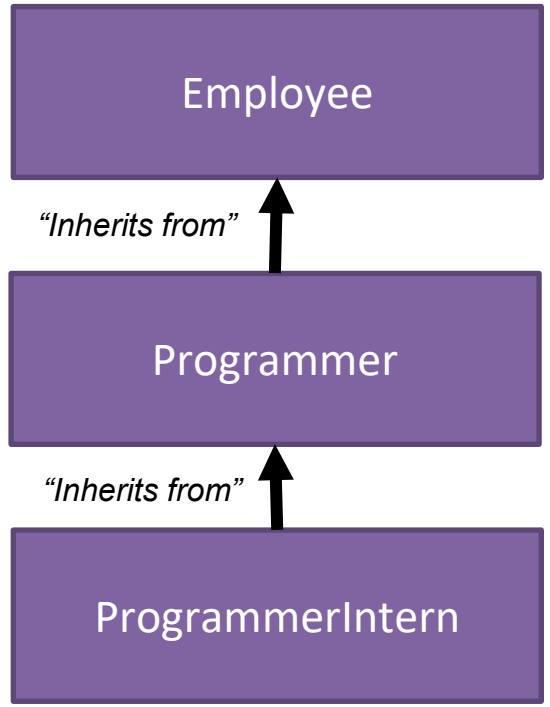
```
public String getName() {
        System.out.println("Method #1 (Employee)");
}
```

Programmer.java

```
public String getName() {
        System.out.println("Method #2 (Programmer)");
}
```

ProgrammerIntern.java

```
public String getName() {
        System.out.println("Method #3 (ProgrammerIntern)");
}
```



What if we define the exact same method in three different classes?

```
ProgrammerIntern intern1 = new ProgrammerIntern("Sally", …);
intern1.getName()
```

What will get printed out?

Method Precedence

Employee.java

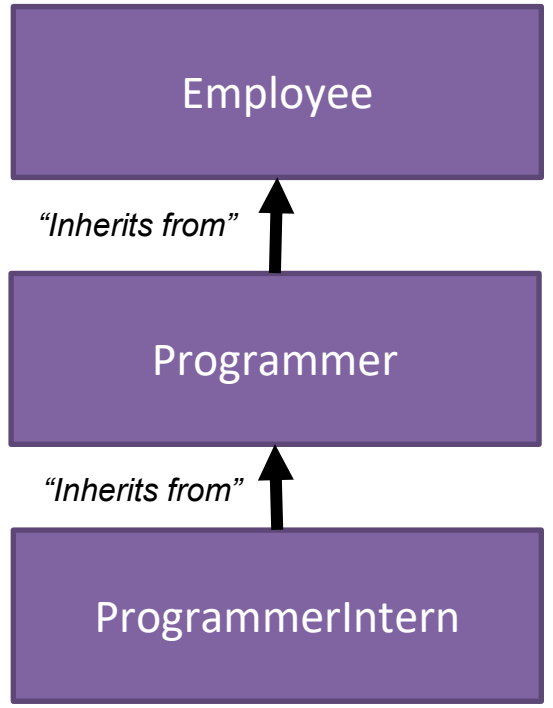
```
public String getName() {
        System.out.println("Method #1 (Employee)");
}
```

Programmer.java

```
public String getName() {
        System.out.println("Method #2 (Programmer)");
}
```

ProgrammerIntern.java

```
public String getName() {
        System.out.println("Method #3 (ProgrammerIntern)");
}
```



What if we define the exact same method in three different classes?

```
ProgrammerIntern intern1 = new ProgrammerIntern("Sally", …);
intern1.getName()
```

What will get printed out?

Output

```
Method #3 (ProgrammerIntern)
```

Takeaway: Java will first look at the child class, and then the parent class

Method Precedence

Employee.java

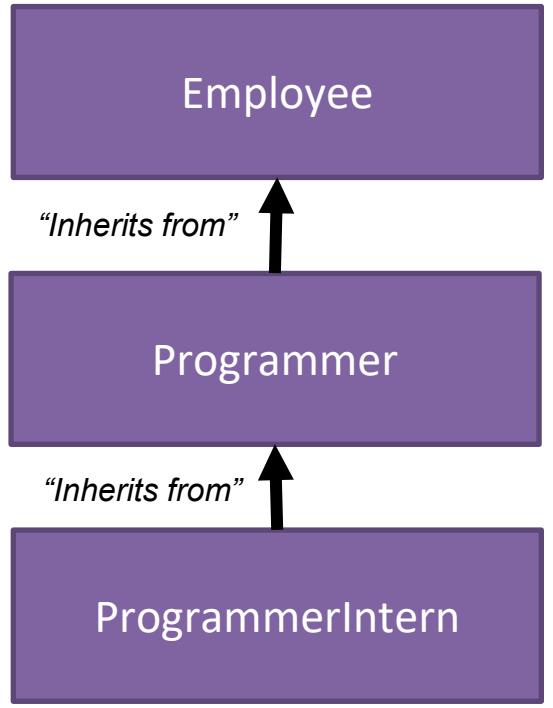
```
public String getName() {
        System.out.println("Method #1 (Employee)");
}
```

Programmer.java

```
public String getName() {
        System.out.println("Method #2 (Programmer)");
}
```

ProgrammerIntern.java

(method deleted)



What if we define the exact same method in three different classes?

```
ProgrammerIntern intern1 = new ProgrammerIntern("Sally", …);
intern1.getName()
```

What will get printed out?

Output

```
Method #2 (Programmer)
```

Takeaway: Java will first look at the child class, and then the parent class