COMP2511

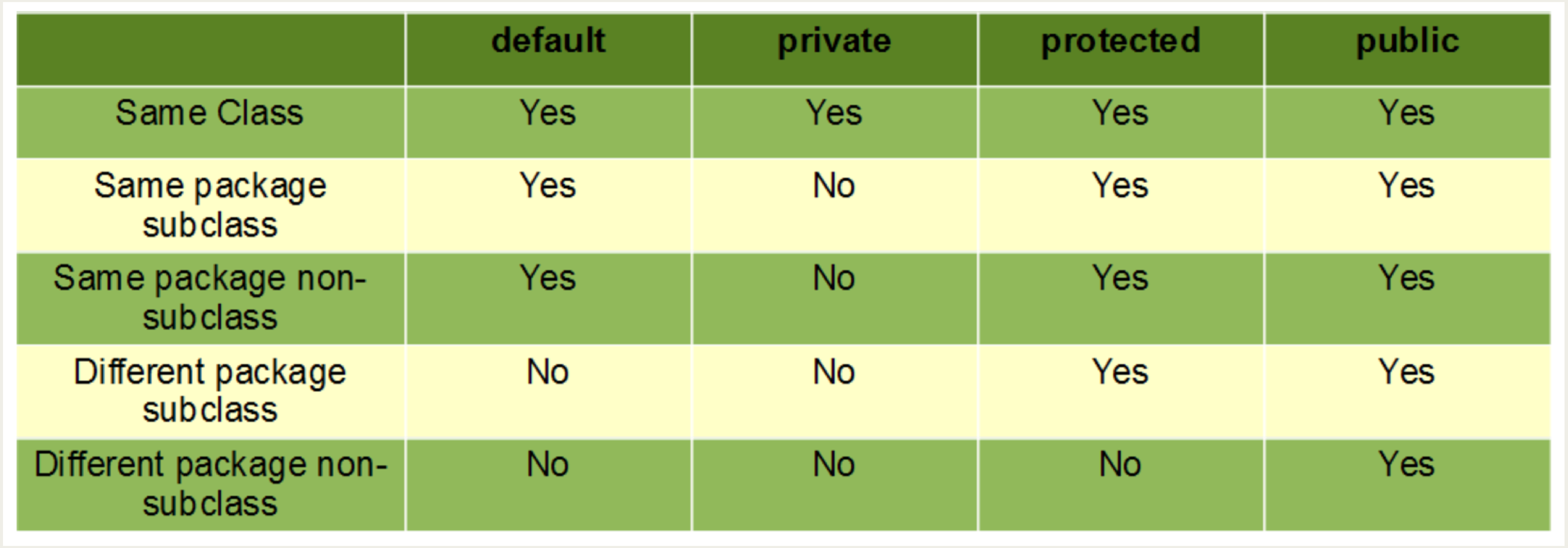
WEEK 2

How did the first programmer program the first programming language for programmers to program programs?

AGENDA

- Access Modifiers & Packages
- Code Review (super vs this)
- Basic Inheritance & Polymorphism
- equals and toString

ACCESS MODIFIERS & PACKAGES



	default	private	protected	public
Same Class	Yes	Yes	Yes	Yes
Same package subclass	Yes	No	Yes	Yes
Same package non-subclass	Yes	No	Yes	Yes
Different package subclass	No	No	Yes	Yes
Different package non-subclass	No	No	No	Yes

INHERITANCE

In Java, a class can inherit attributes and methods from another class. The class that inherits the properties is known as the sub-class or the child class. The class from which the properties are inherited is known as the superclass or the parent class.

Known as a "is-a" relationship

SUPER VS THIS

```java
public class Shape {
    public String color;

    public Shape(String color) {
        System.out.println("Inside Shape constructor");
        this.color = color;
    }
}
```

```java
public class Rectangle extends Shape {
    public int height;
    public int width;

    public Rectangle(String color) {
        super(color);
        System.out.println("Inside Rectangle constructor with one argument");
    }

    public Rectangle(String name, int width, int height) {
        this(name);
        this.width = width;
        this.height = height;
        System.out.println("Inside Rectangle constructor with three arguments");
    }

    public static void main(String[] args) {
        Rectangle r = new Rectangle("red", 10, 20);
    }
}
```

SUPER VS THIS

1. What is the difference between super and this?
2. What about super(...) and this(...)?
3. What are static fields and methods?

SUPER VS THIS

1. What is the difference between super and this?

- super refers to the immediate parent class whereas this refers to the current class

2. What about super(...) and this(...)?

- **super()** acts as a parent class constructor and should be the first line in a child class constructor
- **this()** acts as a current class constructor (can be used for method overloading)

SUPER VS THIS

3. What are static fields and methods?

- **Static fields and methods** are variables that are common and available to all instances of a Class. They belong to the Class, rather than an instance. There is only one copy for all instances.
- **Methods** are a block of code that perform a task. You can think of them as functions of a class.

DOCUMENTATION

- Why is documentation important? When should you use it?
- What does the term "self-documenting" code mean?
- When can comments be bad (code smell)?

DOCUMENTATION

- Why is documentation important? When should you use it?
- What does the term "self-documenting" code mean?
    - Code that documents itself. It is readable inherently. Usually accomplished through variable name and function names
- When can comments be bad (code smell)?
    - Comments become stale & does not get updated with new changes
    - Possibly hinting that your design/code is too complex

DOCUMENTATION

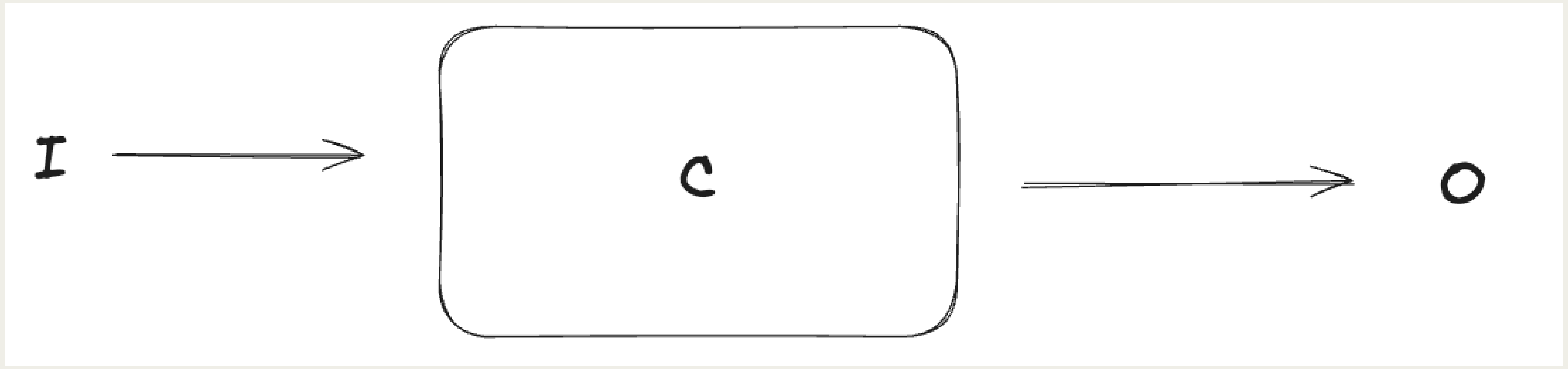
```
// Single line comment
```

```
/**
 * This is multi-line
 * documentation
 */
```

```
/**
 * Constructor used to create a file
 * @param fileName the name of the file
 * @param content contents of the file
 */
```

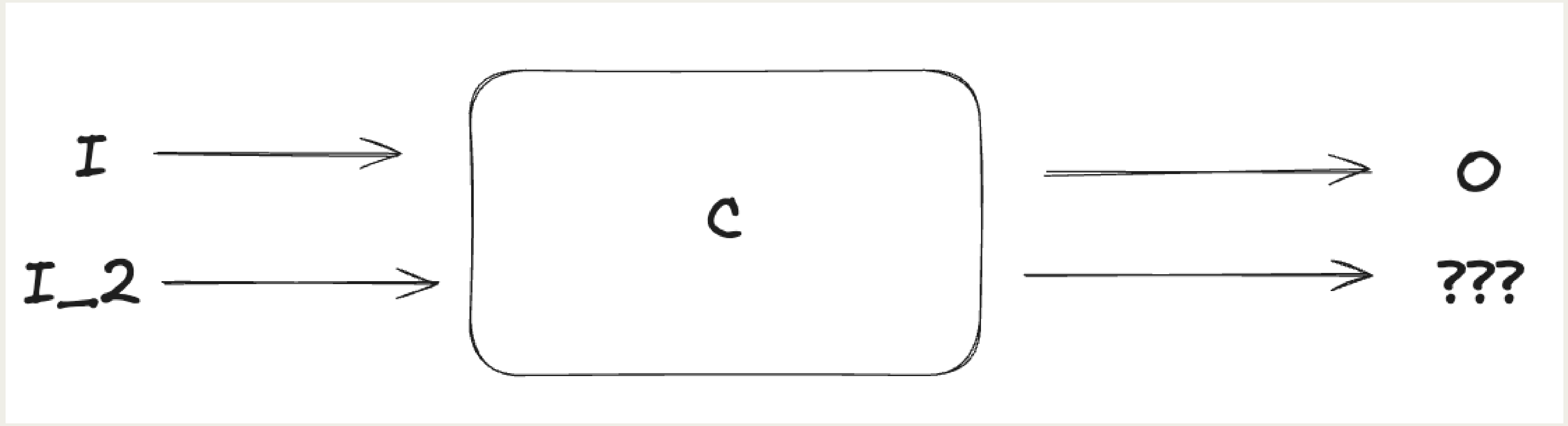
POLYMORPHISM

- Derived from Greek, meaning “having many forms”
  - Poly - many, morphism - form
- Consider the diagram below, we have a method which takes an input, I and outputs O



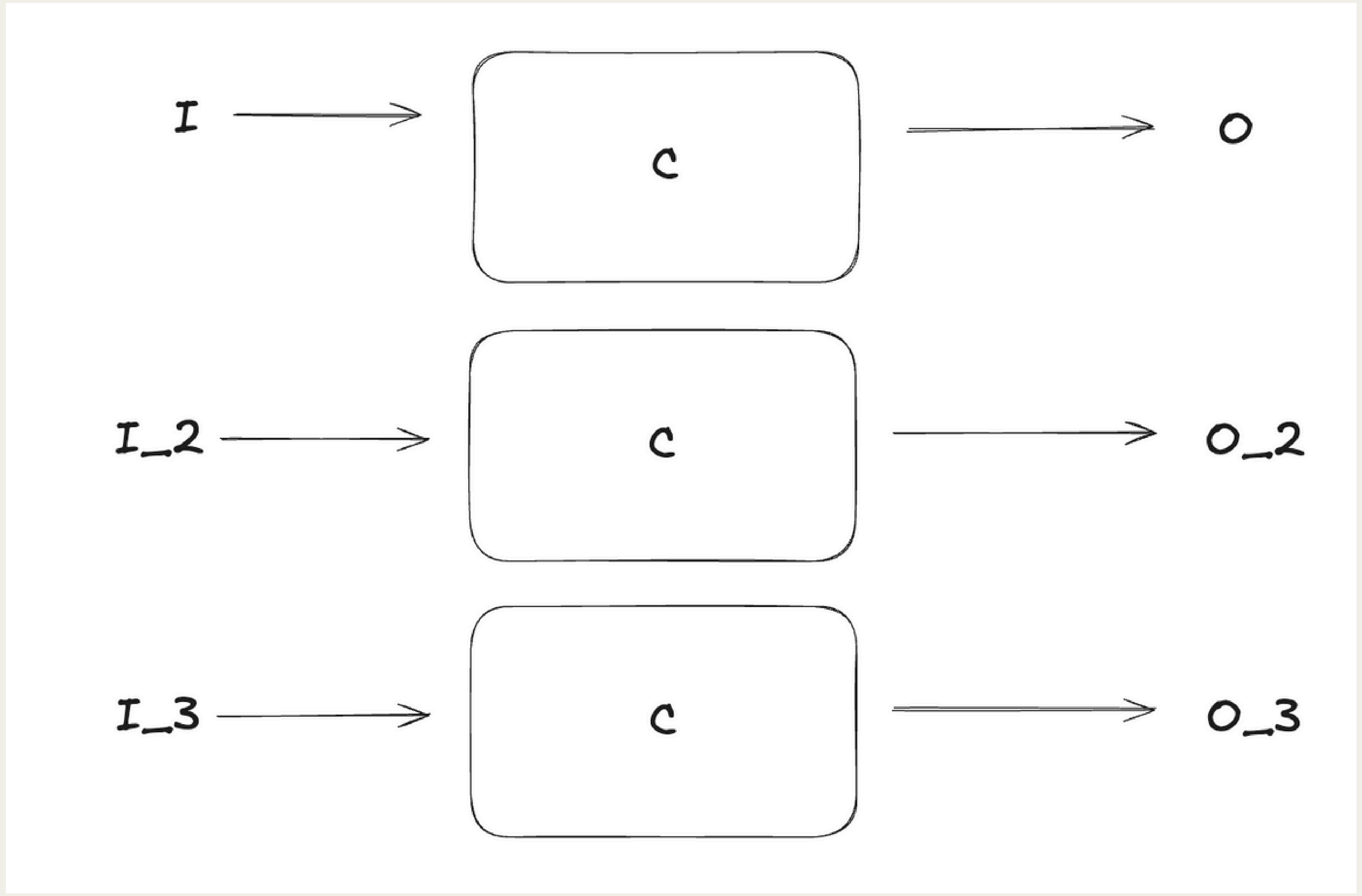
POLYMORPHISM

- But what if we wanted more inputs?

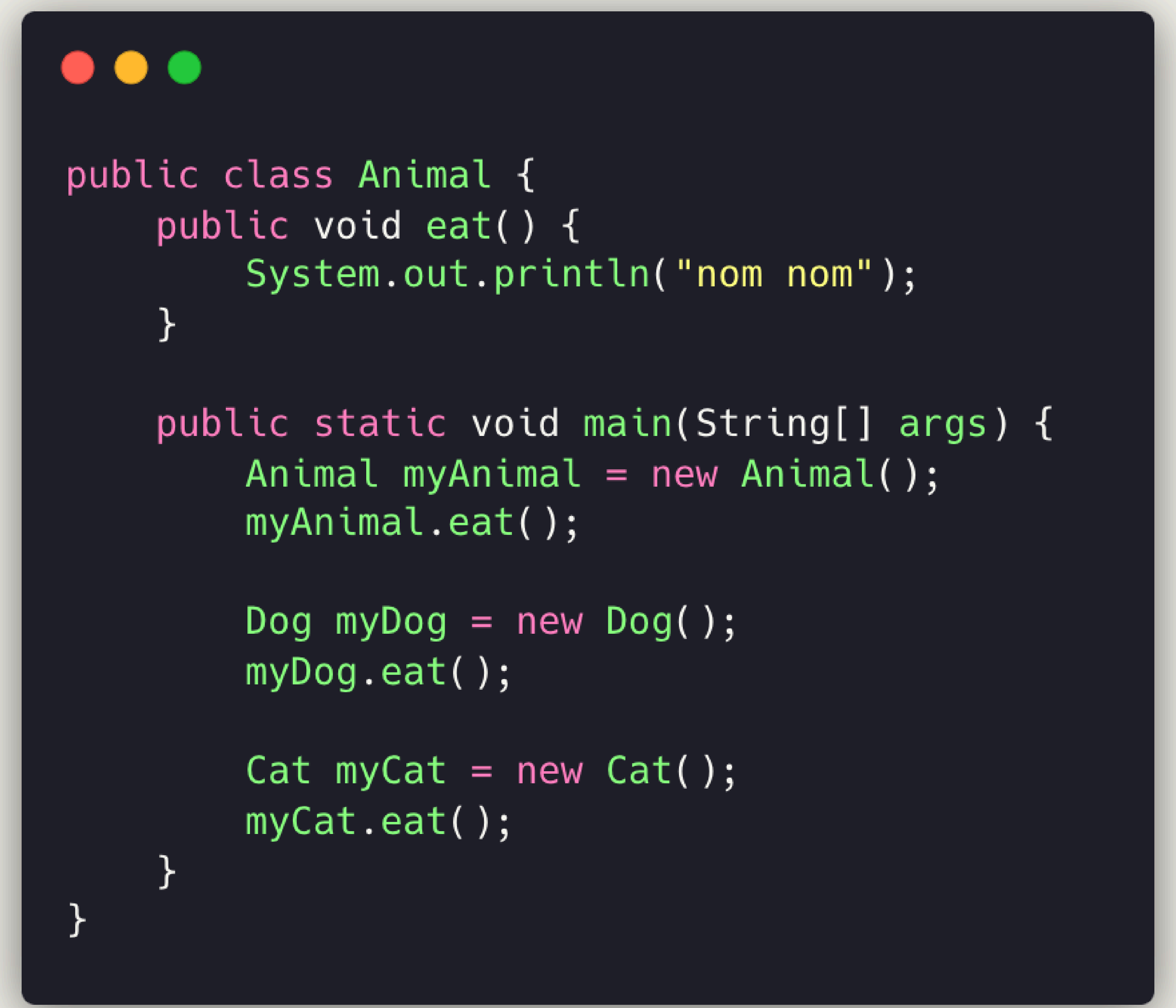


POLYMORPHISM

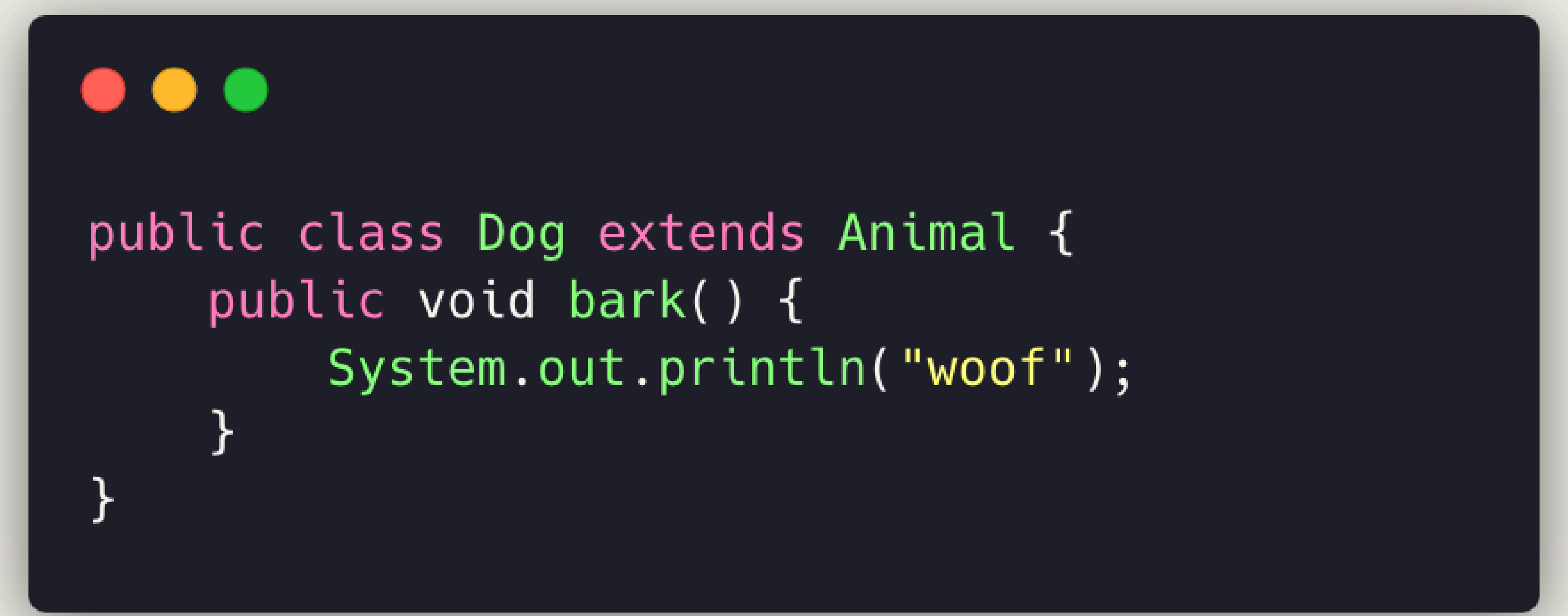
- We can just create more methods to do different things!
- And this is the basic idea behind polymorphism!



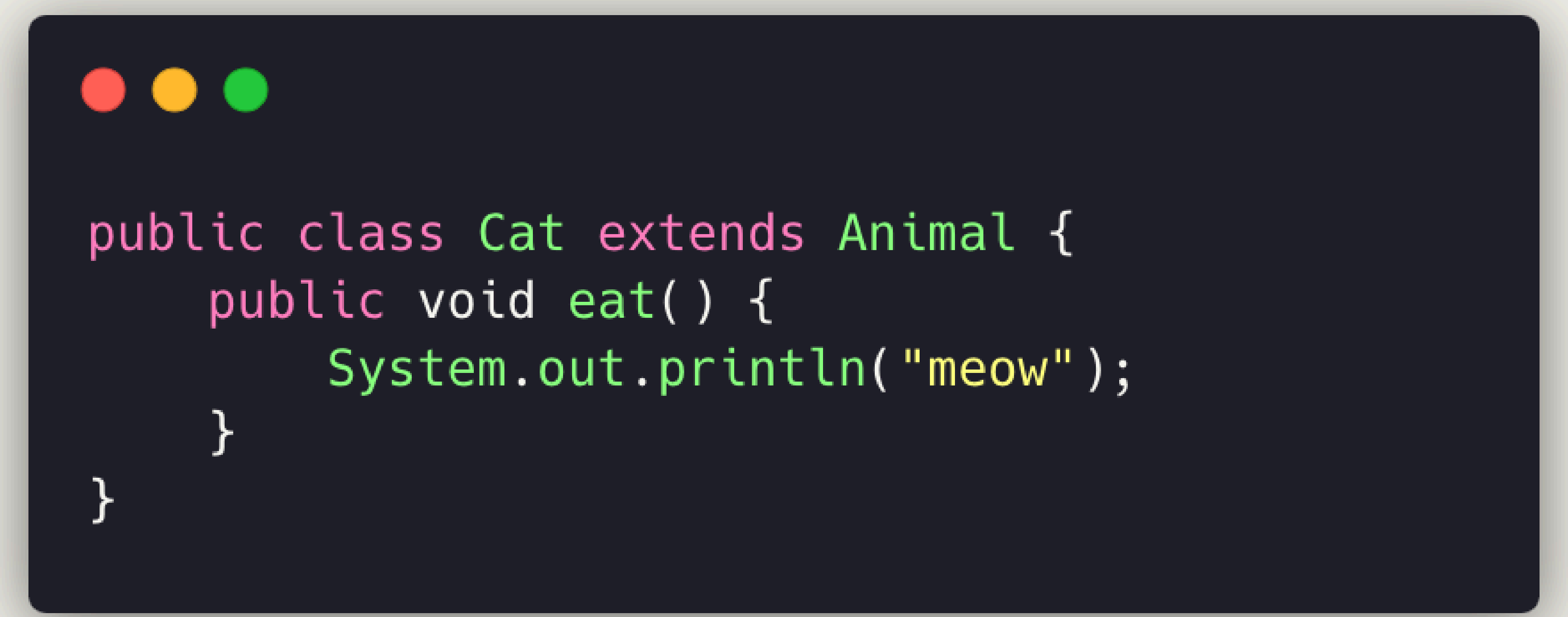
POLYMORPHISM



```java
public class Animal {
    public void eat() {
        System.out.println("nom nom");
    }

    public static void main(String[] args) {
        Animal myAnimal = new Animal();
        myAnimal.eat();

        Dog myDog = new Dog();
        myDog.eat();

        Cat myCat = new Cat();
        myCat.eat();
    }
}
```



```java
public class Dog extends Animal {
    public void bark() {
        System.out.println("woof");
    }
}
```



```java
public class Cat extends Animal {
    public void eat() {
        System.out.println("meow");
    }
}
```

CODE DEMO

1. Create a **Employee** class with a **name** and **salary**
2. Create setters & getters with JavaDoc
3. Create a **Manager** class that inherits **Employee** with a **hireDate**
4. Override **toString()** method
5. Write **equals()** method

HOW MANY CONSTRUCTORS DOES A CLASS NEED?

Technically none. If a class is defined without a constructor, Java adds a default constructor.
However, if a class needs attributes to be assigned (e.g., has a salary), then a constructor must be assigned.
If your class has attributes with no default values, then the **constructor must set these attributes**. This is because variables with no values are dangerous (null), and is also the constructor responsibility.
Each class's constructor is also only responsible for setting **its own attributes**. Do not set the superclass's attributes within the subclasses without using a super(...) constructor call. (In fact super is implicitly called for all subclasses)

toString()

The documentation for the toString() method states that it should return a string that "textually represents" the object. In this case, it should contain the name, salary and hire date (in the case of Manager), but also the runtime class of the object.

EQUALS - MOTIVIATION

- What does the ‘==’ operator do when comparing objects?
- Where have you seen this sort of behaviour before in other languages? How is the underlying data checked for equality in that scenario?
- How can we compare two objects for equality?

EQUALS

- Since we are overriding an existing method (in the super most class called Object), we must follow the conditions described.
- The conditions can be found in the Java Docs

EQUALS

Typical Structure of the equals method will include:

- Check that the passed in object is not null. if (object == null) return false
- Check if the passed in object is the same instance as the calling object.
- if (this == object) return true
- Check the concrete type of the calling object matches the concrete type of the passed in object.
- if (!this.getClass().equals(object.getClass())) return false
- Typecast and then check if all fields are equal

EQUALS - WITH INHERITANCE

What is the relationship between a super type and a sub type in terms of equality? Can a concrete instance of an Employee be equal to an instance of a Manager

- No because of the .getclass() call which will check and compare that the classes are indeed different.

EQUALS - WITH INHERITANCE

How can the method in Manager utilise code in Employee to avoid repetition?

- Obviously, we can use the super method!!!

LABBING :eyes:

BRRRRR