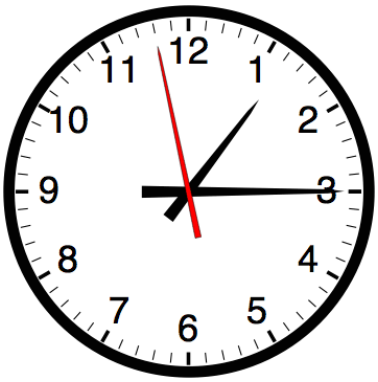
# CS61BL - Inheritance

CS61BL Summer 2009
6/30/2009

## Important Dates

- Project 1 released
  - Tuesday 6/30/2009 – 10pm
- Project 1 - Check-off
  - Thursday 7/02/2009 ready BEFORE lab
- Review Session
  - Sunday 7/05/2009 – 306 Soda 1-4pm
- Midterm 1
  - Tuesday 7/07/2009 – 10 Evans 5-6pm
- Project 2 released
  - Thursday 7/09/2009
- Project 1 due
  - Monday 7/13/2009 – 10pm




## Estimating Time

- Most people grossly underestimate how long it takes to program (not thinking about time to debug and test)
- You appear incompetent at programming (not true) if you can't estimate how long something will take.
- This is one of the hardest things to learn!!! Start to practice now! For each task estimate how long it will take and keep track of how wrong you were


ALL CODE IS GUILTY
UNTIL PROVEN INNOCENT

CODESMACK

## Test Driven Development

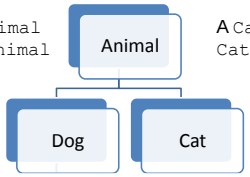
```
static void beAGoodProgrammer()
{
  while (true) // for each method
  {
    writeTest();
    writeCode();
    writeAFewMoreTests();
    writeCode();
  }
}
```

## Why do Test Driven Development?

- It is a way to brainstorm what your method is going to do.
- It is hard to write test cases
- Write your test cases before you're biased by how your code is written

## Inheritance

A `Dog` is an `Animal`
`Dog` extends `Animal`




A `Cat` is an `Animal`
`Cat` extends `Animal`

A `Poodle` is an `Dog`
`Poodle` extends `Dog`

A `Dalmatian` is an `Dog`
`Dalmatian` extends `Dog`

```
public class Animal {
    protected int age = 0;
    public void becomeOlder()
    {
        this.age ++;
    }
    public void eat()
    {
        System.out.println("Animal eat");
    }
}
```

Animal
age 0

```
public class Dog extends Animal {
    protected boolean bites = true;
    public void eat()
    {
        System.out.println("Dog eat");
        System.out.println("Age:" + this.age);
    }
}
```

Dog
age 0
bites true

Animal
age 0

```
public class Animal {
    protected int age = 0;
    public void becomeOlder()
    {
        this.age ++;
    }
    public void eat()
    {
        System.out.println("Animal eat");
    }
}
Animal myAnimal= new Animal();
myAnimal.becomeOlder();
myAnimal.eat();
```

```
public class Dog extends Animal {
    protected boolean bites = true;
    public void eat()
    {
        System.out.println("Dog eat");
        System.out.println("Age:" + this.age);
    }
    public void bark()
    {
        System.out.println("woof");
    }
}
Dog myDog = new Dog();
myDog.eat();
myDog.bark(); // ↓ does this work? ___
myDog.becomeOlder();
```

```
public class Animal {
    protected int age = 0;

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

```
Animal myAnimal= new Animal();
myAnimal.bark();
```

↑Does this work???? _____

## Subclasses (Children) Can

- Declare new instance/class variables
- Declare new methods
- Override old implementations with new implementations
- Access instance/class variables of the superclass (parent) *
- Access methods of the superclass*

* only public, protected or default ones

## Inheritance Puzzles

```
Dog d = new Animal();
```

Does this work? _____

No it doesn't compile, If I want a `Dog`, an `Animal` will be NOT be acceptable because I might want to call a method that only a `Dog` can do!

## Inheritance Puzzles

```
Animal a = new Dog();
```

Does this work? _____

YES it compiles and runs - If I want an `Animal`, a `Dog` will be acceptable because everything an `Animal` can do a `Dog` can do too!

```
Animal a = (Animal) new Dog();
```

## Inheritance Puzzles

```
Animal a = new Dog();
Dog d = a;
```

Does this work? _____

No it doesn't compile. The compiler doesn't know it is really a `Dog`!

but we can **PROMISE** the compiler that it is with a `cast`

## Inheritance Puzzles

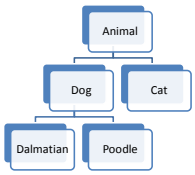
```
Animal a = new Animal();
Dog d = (Dog) a;
```

Does this work? _____

YES and NO - The compiler trusts your PROMISE (cast) but then if you run your program it has a RUN TIME ERROR because `a` is not a `Dog`

## Inheritance Puzzles

```
Animal a = new Cat();
Dog d = (Dog) a;
```




Does this work? _____

YES and NO. It compiles, but then when we try to do the cast we get a RUN TIME ERROR, before we even try to call any `dog` methods on `a`.

## Inheritance Puzzles

```
Animal a = new Dog();
a.bark();
```

Does this work? _____

NO it does not compile - The compiler thinks it is an `Animal`, and an `Animal` does not have a method `bark`

```
Dog d = (Dog) a; d.bark();
((Dog) a).bark();
```

## Inheritance Puzzles

```
Animal a = new Dog();
a.eat();
```

Does this work? _____

YES- The compiler is happy - an `Animal` has an `eat()` method.

Which method is called the `Animal eat()` or the `Dog eat()` ?

## Inheritance Puzzles

```
Animal a = new Dog();
a.eat();
```

Which method is called the `Animal eat()` or the `Dog eat()` ?