

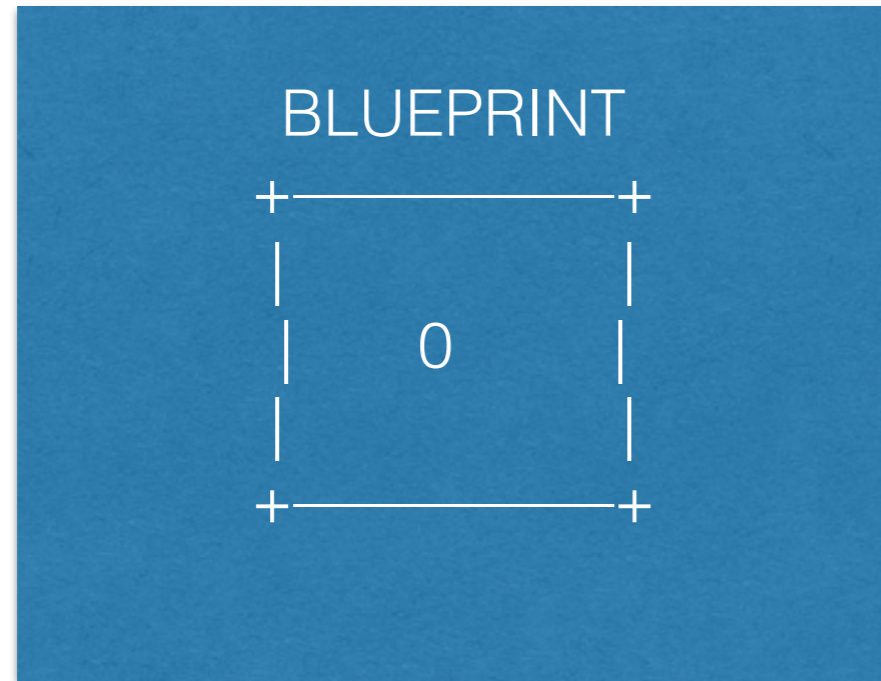
Java, Classes, and Objects

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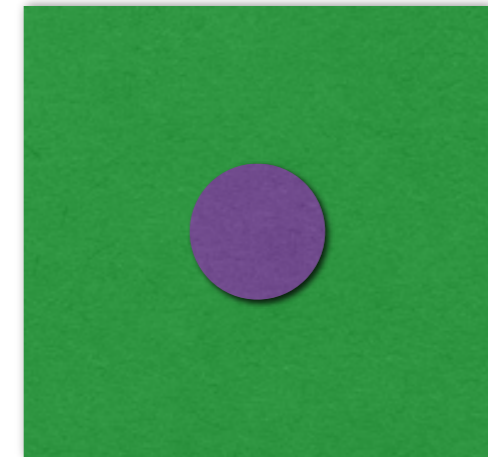
*(with thanks to Eitan Mendelowitz
for his course material)*



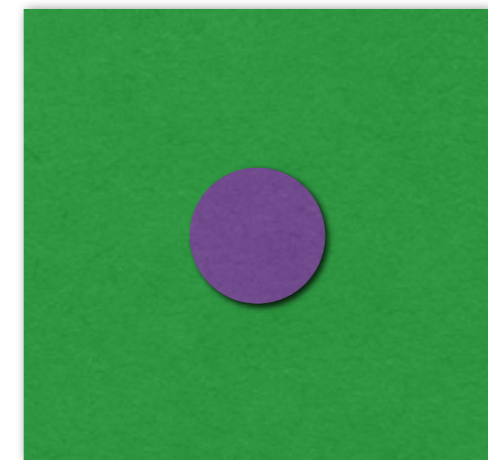
Classes vs. Objects



Class



Object



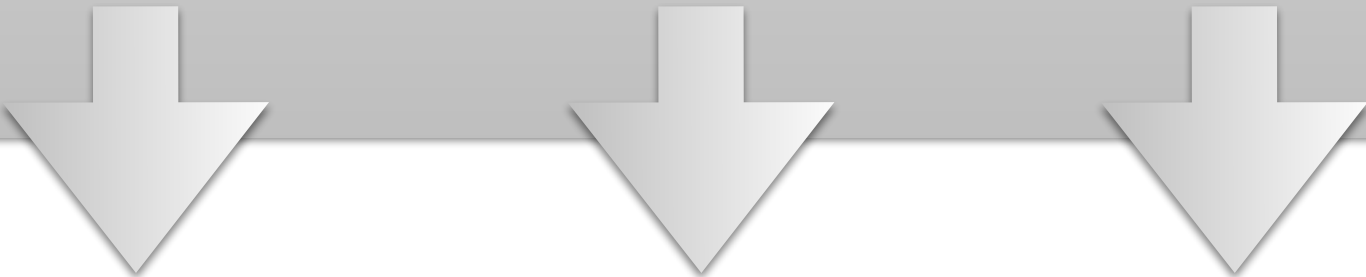
Object

Review of Python Classes

(see Lab 1, Part 1)

Example

```
class Person {  
    String name, Id;  
    int age;  
  
    Person( String n, int a, String i ) {  
        name = n; age = a; Id = i;  
    }  
  
    public void display( ) {  
        System.out.println( name + ": " + age + " years old" );  
    }  
  
    public static void main( String[] args ) {  
        Person p1 = new Person( "Sophia", 29, "990111222" );  
        p1.display();  
        Person p2 = new Person( "Max", 10, "990101010" );  
        p2.display();  
    }  
}
```



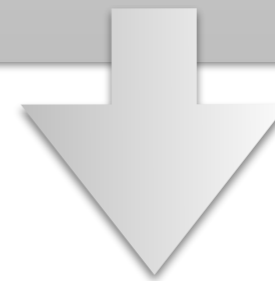
Sophia: 29 years old
Max: 10 years old

Important Concepts

- constructor
- method
- **new**
- overloading (see next slide!)

Overloading

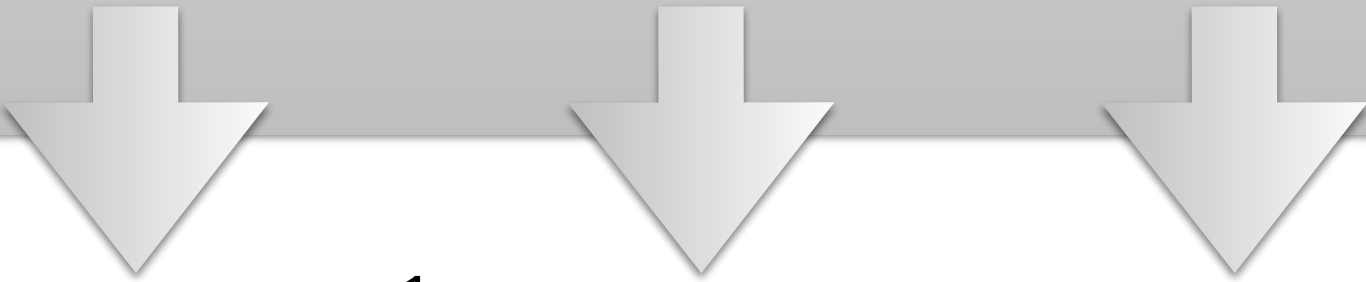
```
class Person {  
    String name, Id;  
    int age;  
  
    Person( String n, int a, String i ) {  
        name = n; age = a; Id = i;  
    }  
    Person( ) {  
        name = "Unknown"; age = 0; Id = "NA";  
    }  
    public void display( ) {  
        System.out.println( name + ": " + age + " years old" );  
    }  
    public static void main( String[] args ) {  
        Person p1 = new Person( "Sophia", 29, "990111222" );  
        p1.display();  
        Person p2 = new Person( );  
        p2.display();  
    }  
}
```



Sophia: 29 years old
Unknown: 0 years old

Overloading (2)

```
class Person {  
    // stuff removed  
  
    public void display( ) {  
        System.out.println( name + ": " + age + " years old" );  
    }  
    public void display( String caption ) {  
        System.out.print( caption + "\n==>" );  
        display();  
    }  
    public static void main( String[] args ) {  
        Person p1 = new Person( "Sophia", 29, "990111222" );  
        p1.display( "p1" );  
        Person p2 = new Person( );  
        p2.display( "p2" );  
    }  
}
```



p1
==>Sophia: 29 years old
p2
==>Unknown: 0 years old

food



0	"Ice Cream"
1	"Sweet"
2	"Nutella"
3	"Chocolate"
4	"Mousse"
5	""

Arrays

```
String[] food = new String[6];  
food[0] = "Ice Cream";  
for (int i=1; i<6; i++ )  
    food[i] = "";
```

or

```
String[] food = { "Ice Cream",  
                  "Sweet", "Nutella",  
                  "Chocolate", "Mousse",  
                  "" };
```


**The size of
an array is
FIXED!!!**



If your program accesses
a cell outside the array...

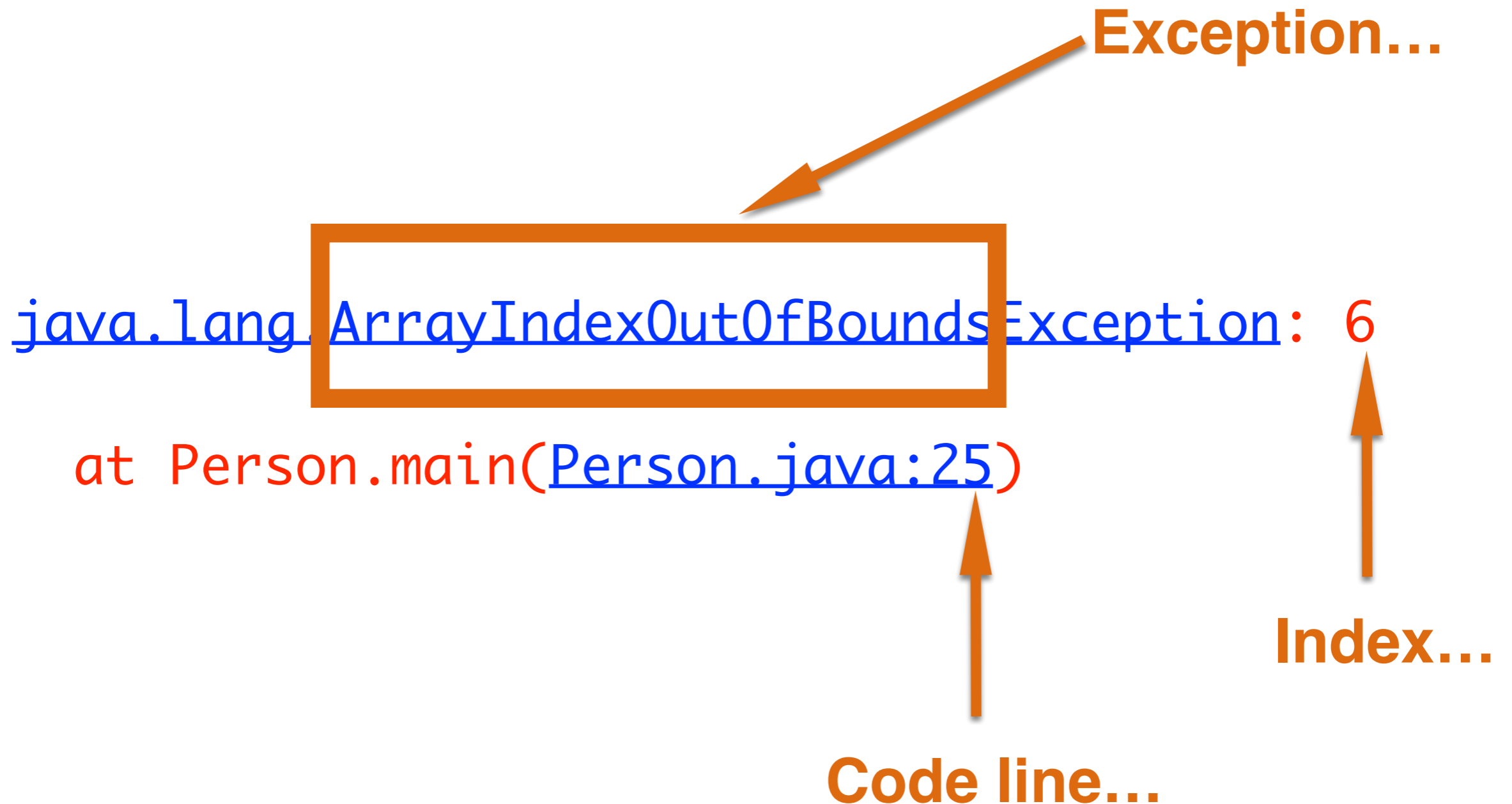
[java.lang.ArrayIndexOutOfBoundsException](#): 6

at Person.main([Person.java:25](#))



CRASH!

If your program accesses
a cell outside the array...



Examples

- A class for a **student**: creates an **array of 5** students ([link](#))

Class Inheritance

Class Inheritance

```
class BigClass {  
  XXXXXXXX X XXX  
  XXXXXX  
  XXXXXXXXXXXX  
  XXXXXXXXXXXX  
  XXXXXXXX  
  XXXXXXXXXXXX  
  XXXXXXXXXXXX  
  XXXXXXXX  
  XXXXXXXX  
  
  XXXXXX  
  XXXXXXXXXXXXXXXXXXXX  
  XXXXXXXX  
  
  XXXXXX  
  XXXXXX  
  XXXXXXXXXXXXXXXXXXXX  
  XXXXXXXX  
  XXXXXX  
  
  XXXXXXXXXXXXXXXXXXXX  
  XXXXXXXX  
  
  XXXXXX  
  XXXXXXXXXXXXXXXXXXXX  
  XXXXXXXX  
}
```

Super Class

Derived Class

Inheritance

```
class NewClass extends BigClass {  
  XXXXXX  
  XXXXXXXXXXXXXXXXXXXX  
  XXXXXXXX  
}
```

Class Inheritance

```
class NewClass extends BigClass {
```

```
xxxxx
```

```
//class BigClass {
```

```
xxxxxxx x xxx
```

```
xxxxxx
```

```
xxxxxxxxxxx
```

```
xxxxxxxxxx
```

```
xxxxxxx
```

```
xxxxxxxxxxx
```

```
xxxxxxxxxxx
```

```
xxxxx
```

```
xxxxxxx
```

```
xxxxx
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xxxxxxxxxxxxxxxxxxxx
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xxxxxxx
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```
xxxxx
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```
xxxxxxxxxxxxxxxxxxxx
```

```
xxxxxxx
```

```
xxxxx
```

```
xxxxxxxxxxxxxxxxxxxx
```

```
xxxxxxx
```

```
xxxxx
```

```
xxxxxxxxxxxxxxxxxxxx
```

```
xxxxxxx
```

```
// }
```

```
xxxxxxxxxxxxxxxxxxxx
```

```
xxxxxxx
```

```
}
```

Examples

- A class for an Animal (super class)
- A class for a Bird (inherited from Animal)
- A class for a Dog (inherited from Animal)

Animal

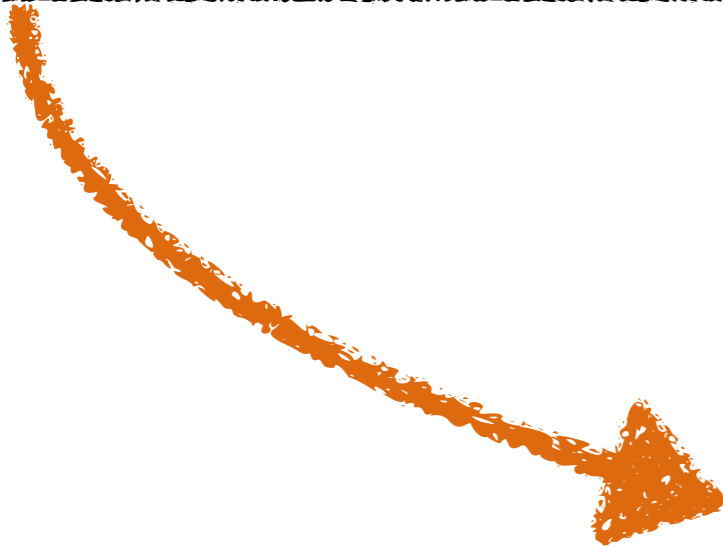
name
age
isVaccinated
isTattooed
Animal()
displayBasicInfo()

Dog<—Animal

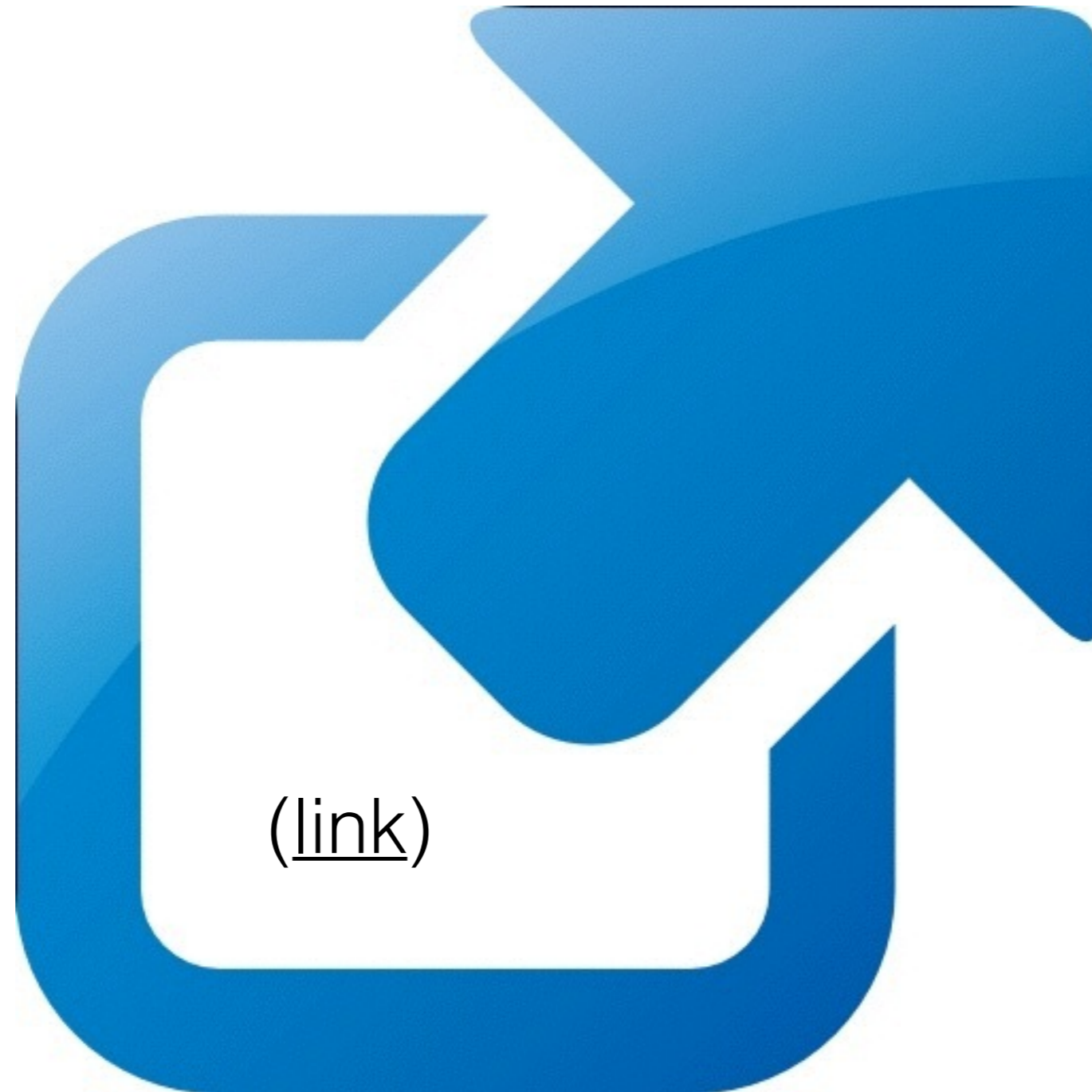
name
age
isVaccinated
isTattooed
legs[]
Animal()
setLegs()
displayBasicInfo()

Bird<—Animal

name
age
isVaccinated
isTattooed
wingSpan
Animal()
displayBasicInfo()



Java Code for Examples



Beowulf2

```

[beowulf2]
[14:18:18] ~/public_html/classes/212$: ls -l *.java
-rw-rw-rw- 1 dthiebaut users 918 Sep 10 14:15 Animal.java
-rw-rw-rw- 1 dthiebaut users 817 Sep 10 14:15 Bird.java
-rw-rw-rw- 1 dthiebaut users 1376 Sep 10 14:15 Dog.java
-rw-rw-rw- 1 dthiebaut users 154 Sep 3 10:26 HelloWorld.java
[beowulf2]
[14:18:22] ~/public_html/classes/212$: javac Animal.java Dog.java Bird.java
[beowulf2]
[14:18:30] ~/public_html/classes/212$: java Animal
Max (3), tattooed, not vaccinated
[beowulf2]
[14:18:34] ~/public_html/classes/212$: java Bird
Toto (23), tattooed, vaccinated, wing-span: 34
Coco (17), not tattooed, vaccinated, wing-span: 29
[beowulf2]
[14:18:40] ~/public_html/classes/212$: java Dog
Rintintin (34), not tattooed, vaccinated, 2 bad leg(s)
Rex (4), tattooed, vaccinated, 1 bad leg(s)
[beowulf2]
[14:18:43] ~/public_html/classes/212$:

```