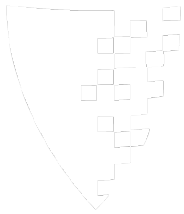
Announcements

- Jotto due February 5
  - Start early!
- Apt set 3 due February 12

- Midterm February 15



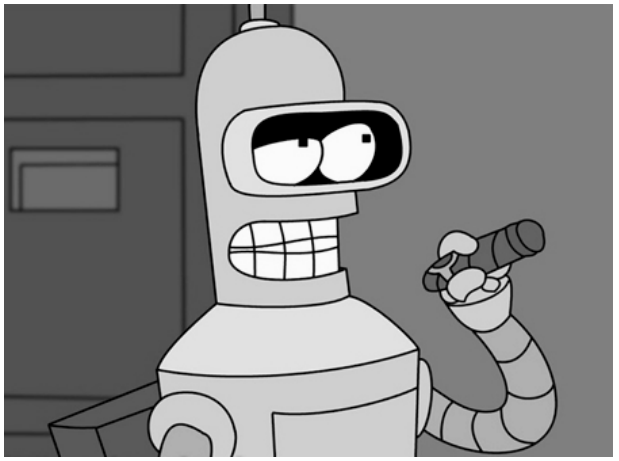
Last class

- Comparing objects
  - equals()
  - compareTo()

public class ThreeInts implements Comparable<ThreeInts>

Today

- extends
- Object
- abstract
- interface

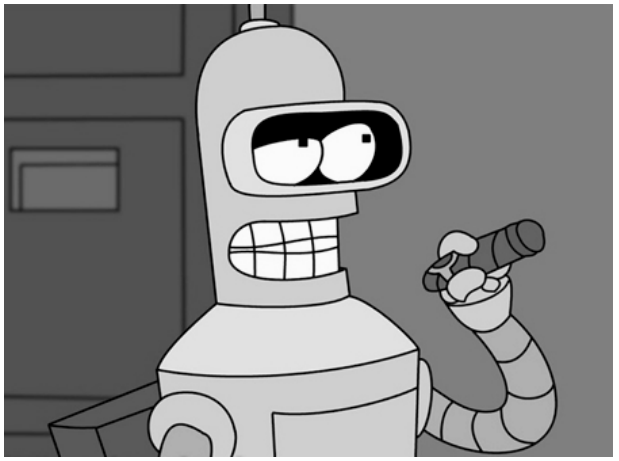


with robots

*APT Comparable code demo (if there is time)

Today

- extends
- Object
- abstract
- interface



with robots

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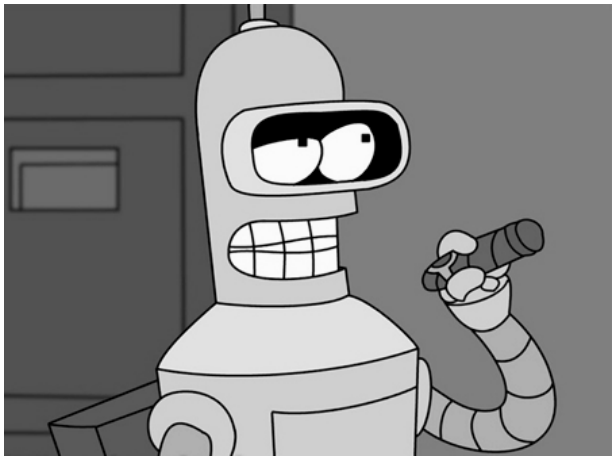
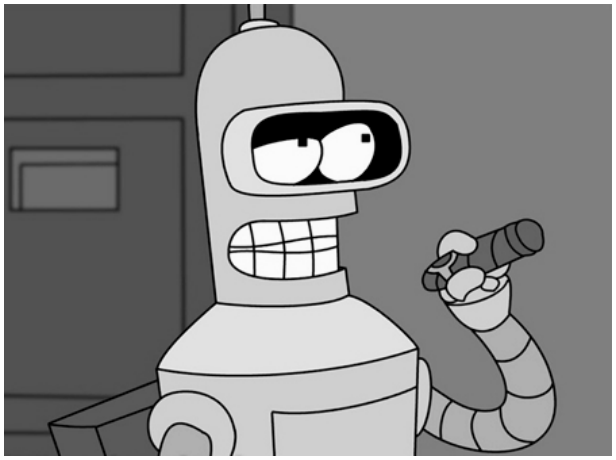
extends

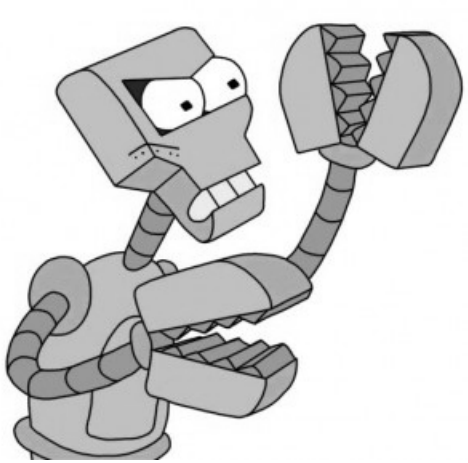


```
class BendingRobot

doBending()
useElectricity()
```

extends





```
class BendingRobot

doBending()
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```
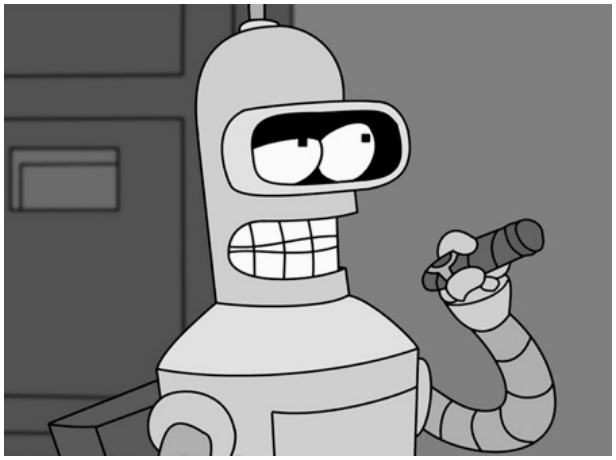
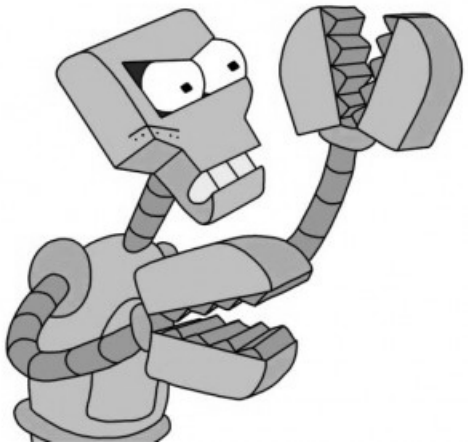

```
class ClampingRobot

doClamping()
useElectricity()
```

extends



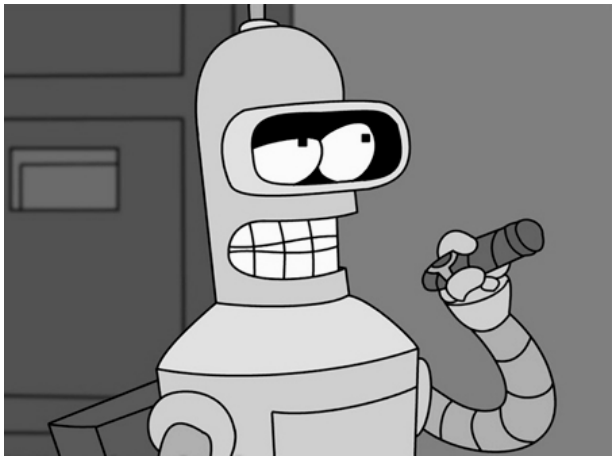


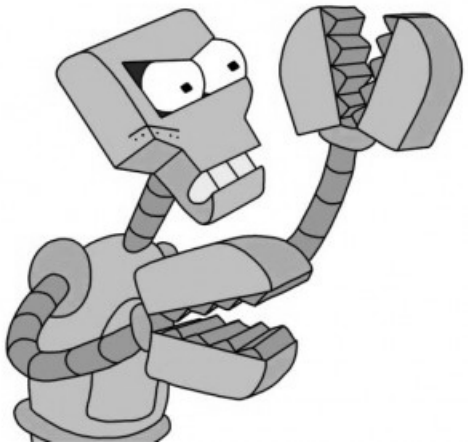
```
class BendingRobot

doBending()
useElectricity()
```

```
class ClampingRobot

doClamping()
useElectricity()
```

```
class EvilSantaRobot

doPunishNaughtyChildren()
useElectricity()
```

extends





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class BendingRobot

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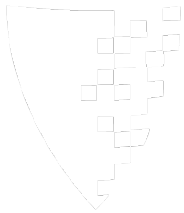
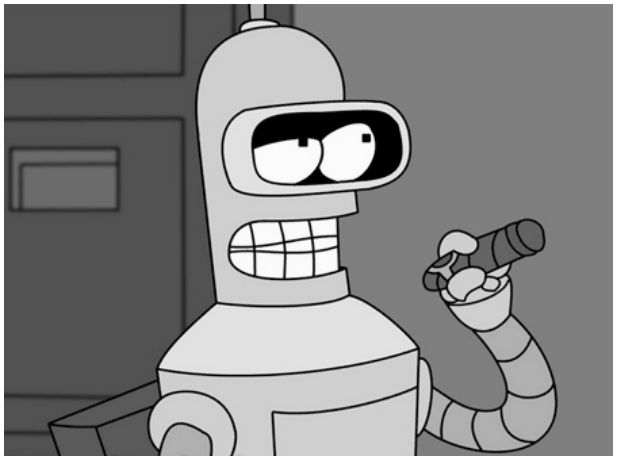


extends

```
class Robot{
    public void useElectricity{

    }

    //other common robot funuctions

}
```

extends

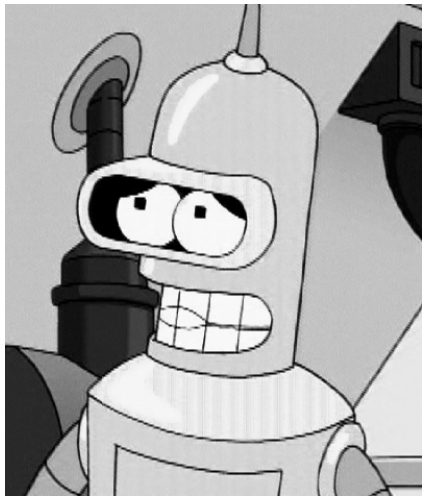
```
class BendingRobot extends Robot{

   doBending(){}
   useElectricity(){}

}
```



- BendingRobot inherits useElectricity from Robot.

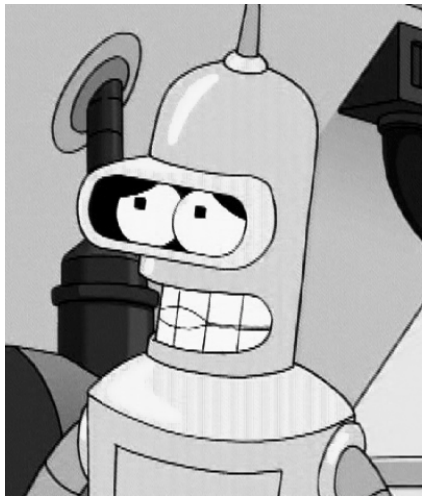
extends

```
class GoldBendingRobot extends
BendingRobot{

   doSuperBending(){}
   doBending(){}
   useElectricity(){}

}
```



extends

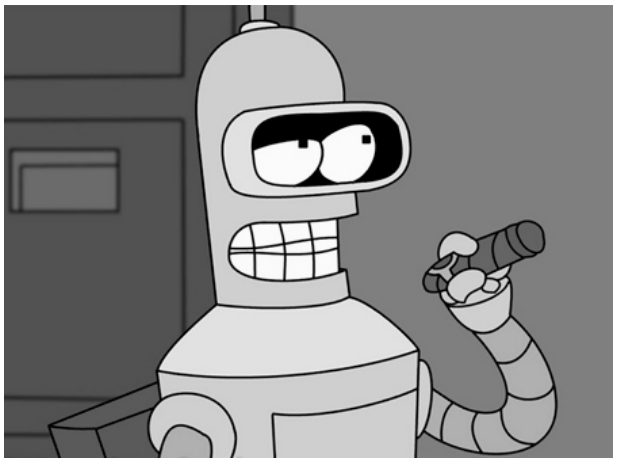
- BendingRobot – Superclass
  - GoldBendingRobot – Subclass
  - Subclass inherits from superclass



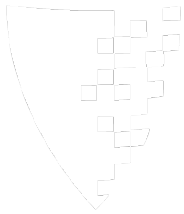
```
GoldBendingRobot goldBot = new GoldBendingRobot();
goldBot.doBending();
goldBot.doSuperBending();
```

extends

- BendingRobot – Superclass
  - GoldBendingRobot – Subclass
  - Superclass does not inherit from subclass



```
BendingRobot someBender = new GoldBendingRobot();
someBender.doBending();
someBender.doSuperBending(); //NOT ALLOWED
```

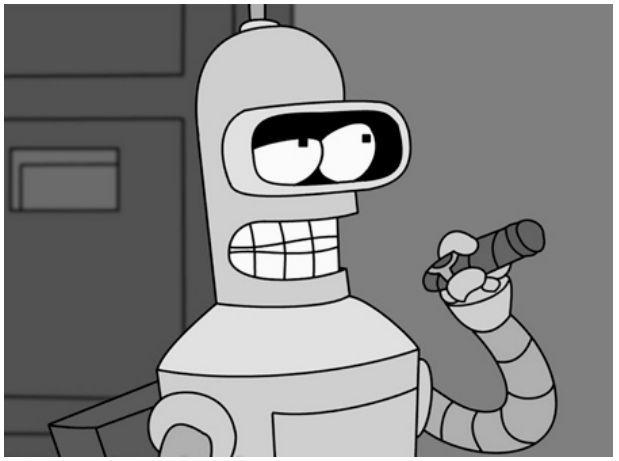


extends

- A extends B – A inherits all functions and variables from B
- Subclass A can be used anyplace superclass B can.
- Subclass A can “override” functions in superclass B
- Always use the most general type possible

Today

- extends
- Object
- abstract
- interface

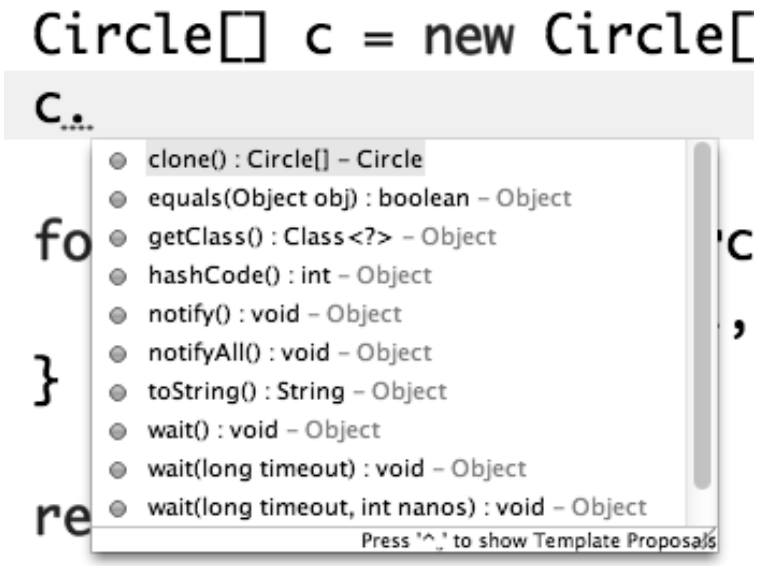


with robots

*APT Comparable code demo (if there is time)

Object

- Object (Java class) – superclass of your class
- All objects inherit
  - .equals()
  - .toString()
  - .hashCode()



- You can Override superclass with your own code!

Today

- extends
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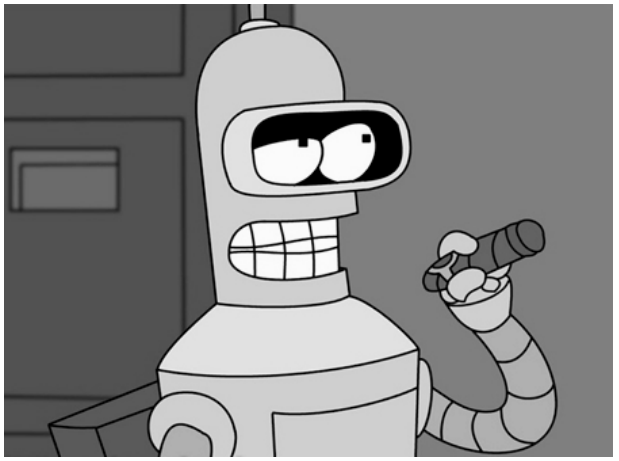

with robots

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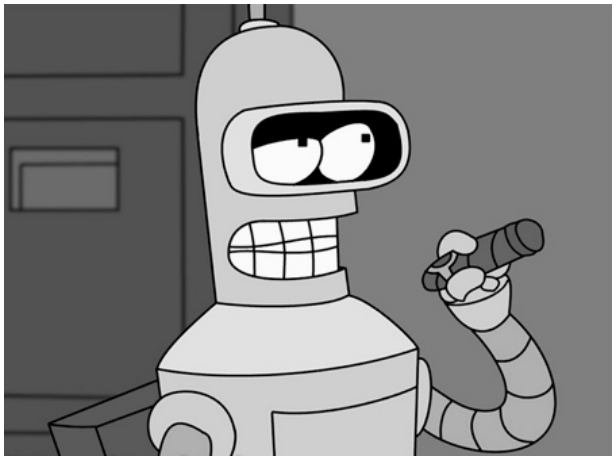
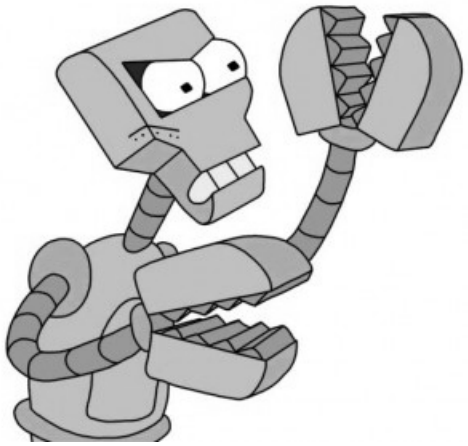
abstract





```
class BendingRobot

doBending()
useElectricity()
```

```
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```

```
class EvilSantaRobot

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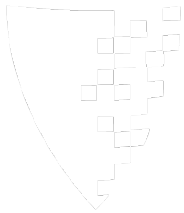


abstract

```
abstract class Robot{
    abstract public void useElectricity();
        //all robots use electricity
        //but it may be different!!!!

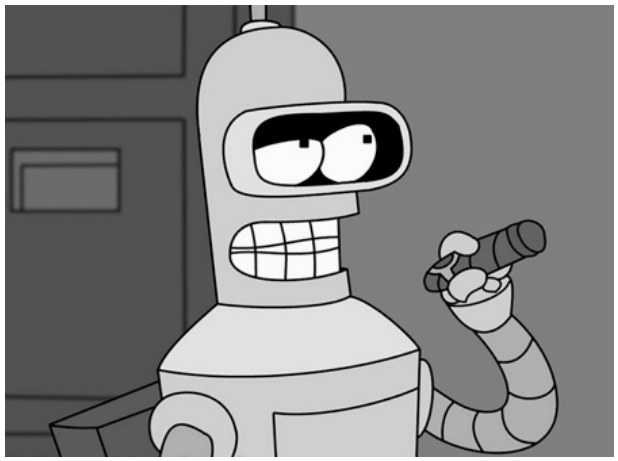
    public void beep(){
        System.out.println("Beep!");
        //this is the same for all robots!!!!
    }
}
```

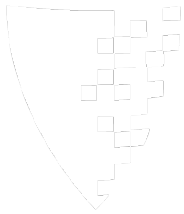
abstract

```
1  class BendingRobot extends GenericRobot
   {
2      //must implement abstract methods
3      public void useElectricity() {
4          //your code goes here
5      }
6  }
```

abstract

```
1  //doesn't matter what kind of Robot
2  GenericRobot myRobot = new BendingRobot();
3  BendingRobot bendRobot = new BendingRobot();
4  myRobot.beep();
5  myRobot.useElectricity();
6  GenericRobot otherBot = new GenericRobot(); //
   NOT ALLOWED
```





abstract

- *abstract* superclass contains *abstract* functions
- Subclass A of abstract superclass B must implement the abstract functions
- Can have variables of abstract superclass type, but cannot create objects of abstract superclass (can never use new)

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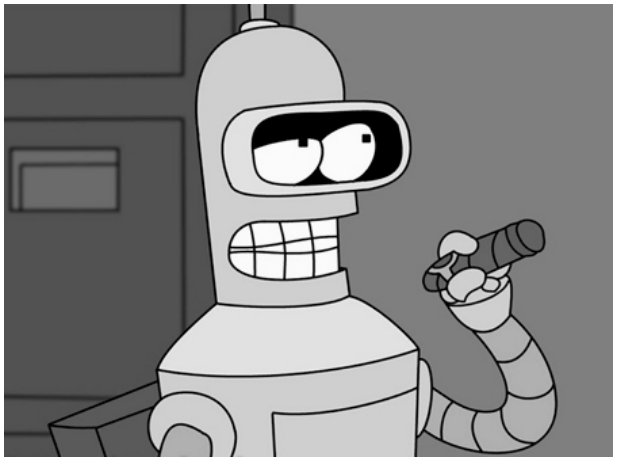

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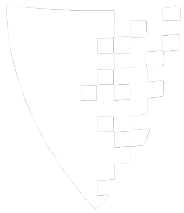

interface

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    }
}
```
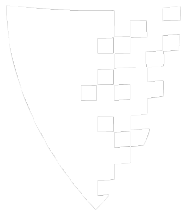



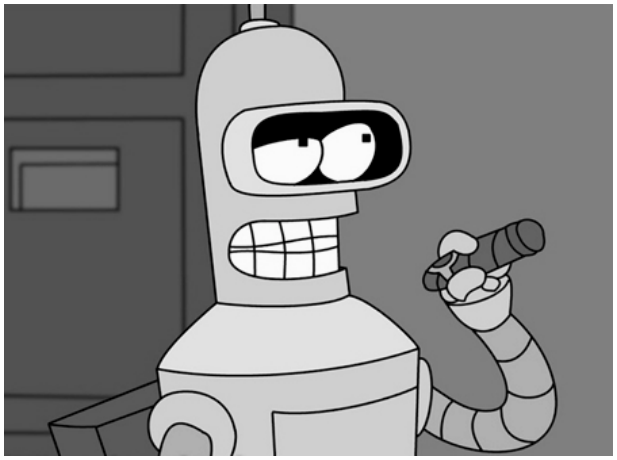
interface

```
interface MoveRobot{
        void moveForward();
}
```

*all of our methods are abstract

interface

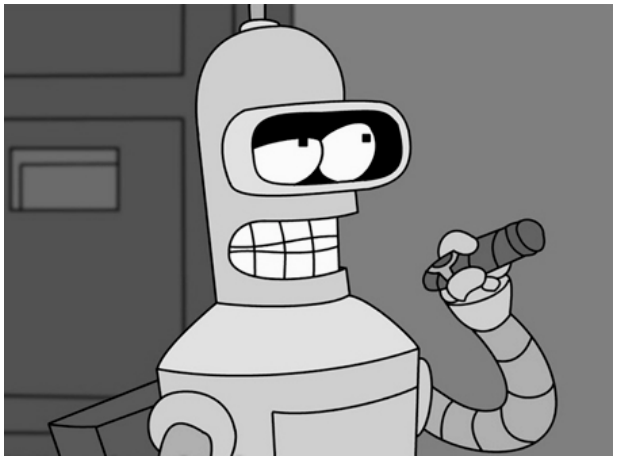
```
class BendingRobot implements
MoveRobot{

   doBending(){}
   moveForward()
}
```



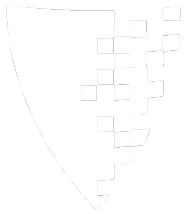
- BendingRobot must implement methods from MoveRobot.

interface

```
class BendingRobot extends Robot
implements MoveRobot{

   doBending(){}
   moveForward(){}
   useElectricity(){}
}
```



- BendingRobot must implement methods from MoveRobot, but inherits methods from Robot.



interface

- Similar to a superclass, but has no implemented methods
- You implement an interface in the same way you extend a superclass
- You can implement many interfaces, but only extend one superclass

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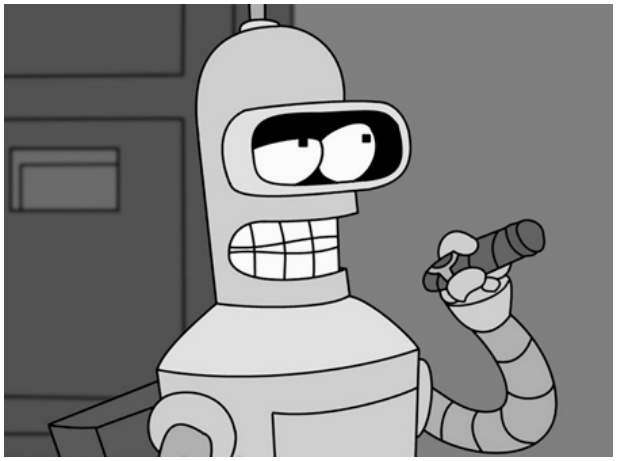

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