


## Announcements

- Apt set 2 due tomorrow!
- Jotto due February 5
  - Start early!


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## Last class

- **Big-Oh**
  - Recitation questions?


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## Today

- Comparing objects
  - Are they the same?
    - `.equals()`
  - What is the order?
    - `compareTo()`


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## Primitives

- `int i = 5;`
- `int j = 5;`
- `if(i == j)`
  - `doSomething();`
- `else`
  - `doSomethingElse();`


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## Objects

- `int[] array1 = new int[5];`
- `int[] array2 = new int[5];`
- 
- 
- `if(array1 == array2)`
  - `doSomething();`
- `else`
  - `doSomethingElse();`

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## Objects

- `int[] array1 = new int[5];`
- `int[] array2 = new int[5];`
- 
- 
- `if(array1 == array2)`
  - `doSomething();`
- `else`
  - `doSomethingElse();`

DO NOT  
USE ==  
FOR  
OBJECTS

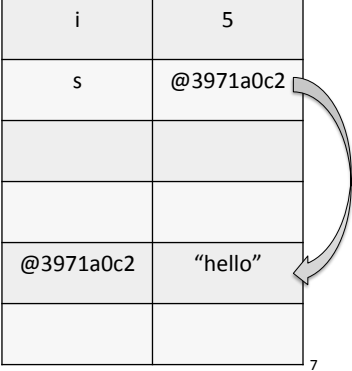
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## Objects

- Primitives are saved as values
- Objects are saved as reference values - value that points to another value somewhere in memory

- `int i = 5;`
- `String s = "hello";`

i	5
s	@3971a0c2
@3971a0c2	"hello"



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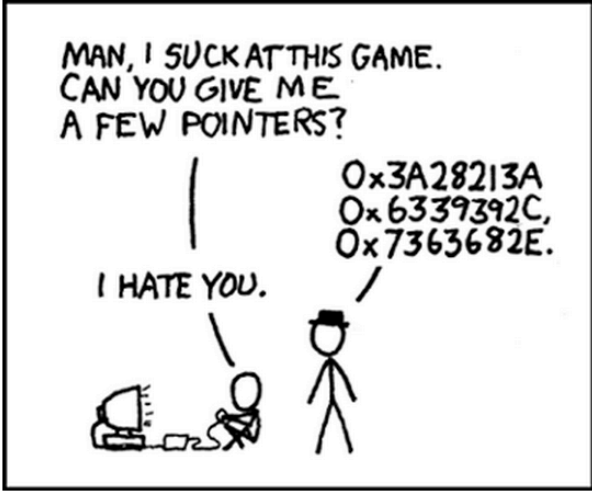
## Pointers

MAN, I SUCK AT THIS GAME.  
CAN YOU GIVE ME  
A FEW POINTERS?

|

I HATE YOU.

0x3A28213A  
0x6339392C,  
0x7363682E.

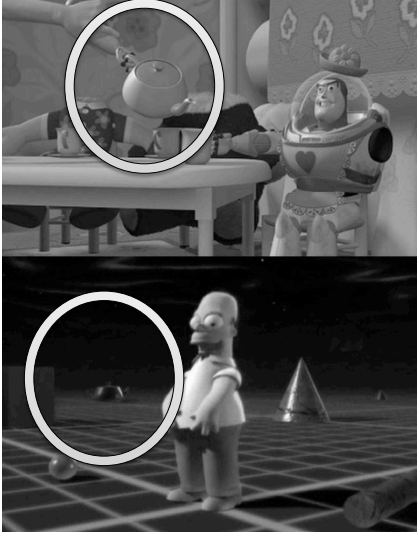


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## How to compare objects?

- Is this the same teapot?



- `teapot1.equals(teapot2);`

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## .equals()


- Built in Java function for Object
- All objects inherit .equals()

```
Circle[] c = new Circle[numCircles];
c..
fo
}
re
```

- `clone() : Circle[] - Circle`
- `equals(Object obj) : boolean - Object`
- `getClass() : Class<?> - Object`
- `hashCode() : int - Object`
- `notify() : void - Object`
- `notifyAll() : void - Object`
- `toString() : String - Object`
- `wait() : void - Object`
- `wait(long timeout) : void - Object`
- `wait(long timeout, int nanos) : void - Object`

```
cles; i++){
, i, colors[i%#
```

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## .equals()

```

1   Threelnts a = new Threelnts(5,5,5);
2   Threelnts b = new Threelnts(5,5,5);
3
4   if(a.equals(b))
5       System.out.println("equal");
6   else
7       System.out.println("not equal");

```

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## .equals()

- Built in Java function for Object
- All objects inherit .equals()
  - You can Override .equals() with your own code!

```

Circle[] c = new Circle[numCircles];
c..
fo
}
re

```

- clone() : Circle[] - Circle
- equals(Object obj) : boolean - Object
- getClass() : Class<?> - Object
- hashCode() : int - Object
- notify() : void - Object
- notifyAll() : void - Object
- toString() : String - Object
- wait() : void - Object
- wait(long timeout) : void - Object
- wait(long timeout, int nanos) : void - Object

Press ^, to show Template Proposals

```

        cles; i++){
        , i, colors[i%

```

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## .equals()

```


1 public boolean equals(Object obj){
2     if (obj == this) {
3         return true;
4     }
5     if (obj == null || obj.getClass() !=
        this.getClass()) {
6         return false;
7     }
8     YourObjectType temp = (YourObjectType) obj;

```


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## compareTo()

- We can make things equals, but what about ordering?




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## compareTo()

```
1 public class ThreeInts implements  
   Comparable<ThreeInts>  
  
2     public int compareTo(ThreeInts arg0) {  
3         //code goes here  
4         return 0;  
5     }
```

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## compareTo()

```
1 public class ThreeInts implements  
   Comparable<ThreeInts>  
  
2     public int compareTo(ThreeInts arg0) {  
3         //code goes here  
4         return 0;  
5     }
```

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## Code time

- Create a class `ComplexNumber`
  - use `ThreeInts` as your guide
- `ComplexNumber` objects should have only two instance variables, `myR` and `myI`
- Write a `.equals()` and `compareTo()`
  - complex numbers should be compared using magnitudes

$$\sqrt{r^2 + i^2}$$

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## Today

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