Lecture Set #9: Review of Aliasing & Mutability, Floating Point Calculation Issues

1. Floating Point calculation Issues
2. Aliasing and Mutability
3. Example class development: Password

Floating Point Calculations

What will this print?

```java
public class SimpleMath {
    public static void main(String[] args) {
        if (3.9 - 3.8 == 0.1) {
            System.out.println("I am a very smart computer.");
        } else {
            System.out.println("I can't do simple arithmetic.");
        }
    }
}
```

- I can’t do simple arithmetic.
  - Why?
  - Conversion of floating point to binary leads to precision errors!
  - What can we do?
Floating Point Calculations (cont.)

Two important rules:

- You can never use == to compare floating point values. Instead, check if two numbers are within a certain tolerance of each other.
- Never use floating point values to represent money, e.g., 3.52 to represent $3.52. Instead, use integer 352 to represent 352 pennies.

Taking Care of Corner Cases

- FancyWord example from CVS
  - String of "" was a corner case that we needed to test for
  - Write new test cases or new asserts in the test cases that already exist to take care of this
- What about null references as corner cases?

```java
public void testNullAndEmpty(){
    FancyWord a = new FancyWord(null);
    assertEquals(null,a.toString());
    FancyWord b = new FancyWord("";)
    assertEquals("",b.toString());
}
```
What about Strings and Aliasing?

- **String** objects are *immutable*; fields cannot be changed once created
  - **Mutable** objects: fields (values of instance variables) can be changed (e.g. Cat, Student, etc.)
  - **Immutable** objects: fields (values of instance variables) cannot be changed

- In the Cat and CatOwner example:
  - when one object is assigned to another, an alias is created
  - Cat a = new Cat(“Fluffy”);
  - Cat b = a;

Which picture represents the current status of memory?

Stack
---
| a | b |

Heap
---

```
Fred
```

Stack
---
| a | b |

Heap
---

```
Fred
```

Code Development Example

- Constructors
- this
- Instance/static
- Scope
- Random number generation
- Improving consistency of instance values
- toString
- equals