Lecture 6 - Sep 23

OOP Review

Use and Misuse of Static Variables
Use of this: Marriage Example
Reference-Typed Return Values
Anonymous Objects

Announcements/Reminders

- Today's class: notes template posted
- Priorities:
  - + Review Lab0
  - + Complete Lab1
  - + Due: Next Tuesday (Sep 30)
- ProgTest0 (this Wednesday, Sep 24):
  - + Guide & Mockup Test released
  - + **Required**: Go to your **enrolled** session.
  - + A physical **photo ID** is required.

Alt String id_str = "Id" + id;

Managing Account IDs: Automatic

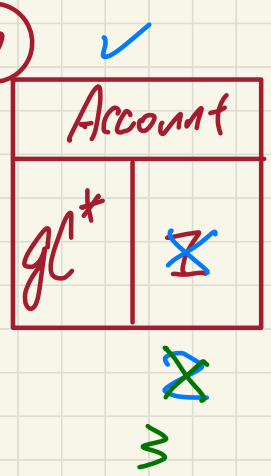
id_str
"Id1"
"Id2"
⋮

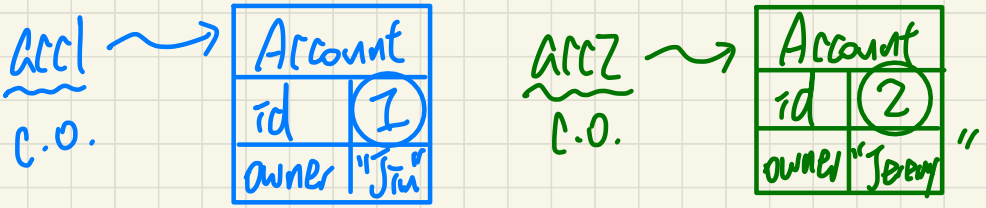
```
class Account {
  private static int globalCounter = 1;
  private int id; String owner;
  public Account(String owner) {
    this.id = globalCounter;
    globalCounter ++;
    this.owner = owner; } }
```

global
local
acc1 acc2
list of parameters not including id anymore (not burden of user of Account const.)

```
class AccountTester {
  Account acc1 = new Account("Jim");
  Account acc2 = new Account("Jeremy");
  System.out.println(acc1.getID() != acc2.getID()); }
```

0
1
1
2

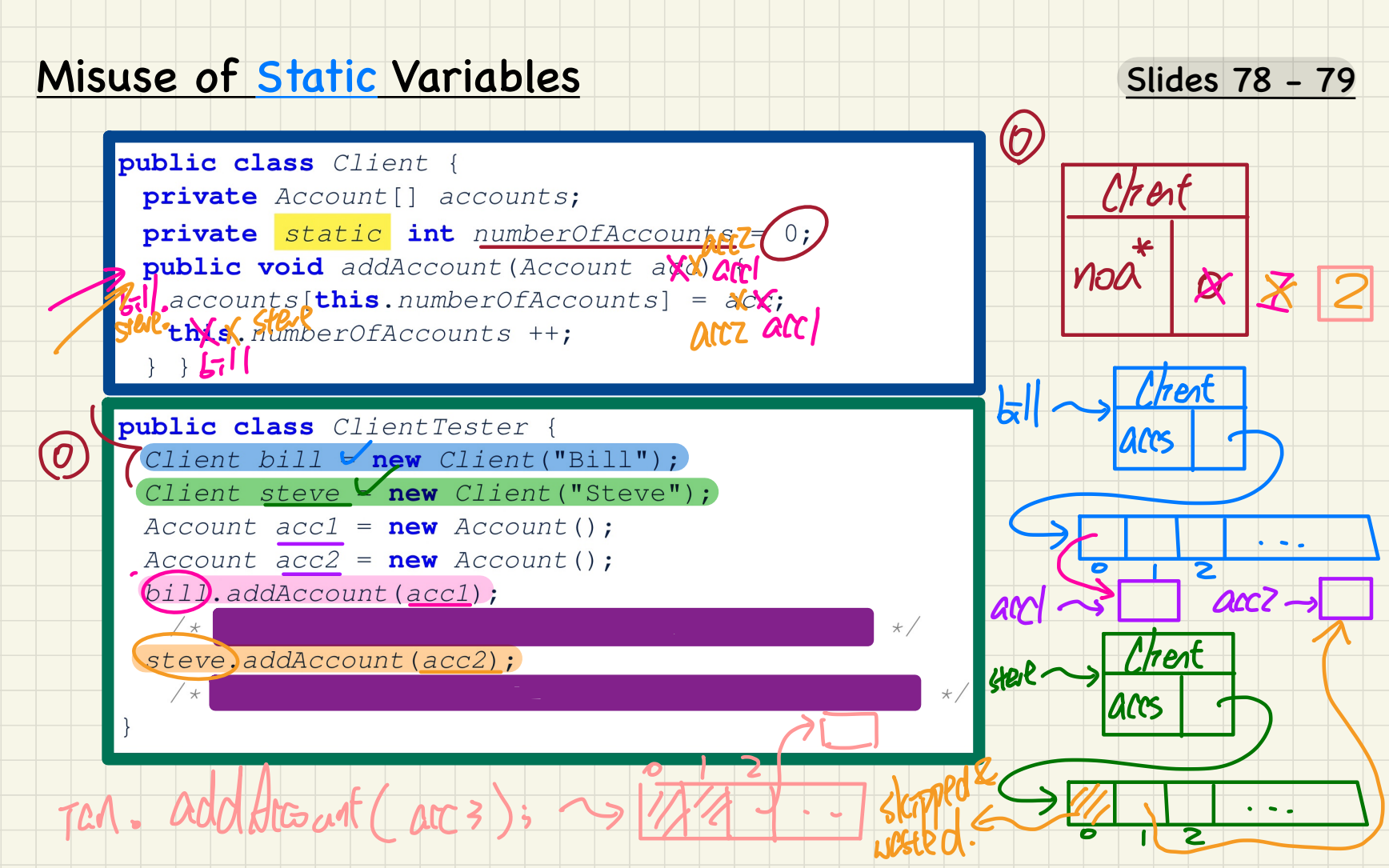




Misuse of Static Variables


```
public class Client {
  private Account[] accounts;
  private static int numberOfAccounts = 0;
  public void addAccount(Account acc) {
    this.accounts[this.numberOfAccounts] = acc;
    this.numberOfAccounts ++;
  } }
```

```
public class ClientTester {
  Client bill = new Client("Bill");
  Client steve = new Client("Steve");
  Account acc1 = new Account();
  Account acc2 = new Account();
  bill.addAccount(acc1);
  /* [redacted] */
  steve.addAccount(acc2);
  /* [redacted] */
}
```



Use of Static Variables: Common Error


```
1  public class Bank {
2      private string branchName;
3      public String getBrachName() { return this.branchName; }
4      private static int nextAccountNumber = 0;
5      public static String getInfo() {
6          nextAccountNumber++;
7          return this.branchName + nextAccountNumber;
8      }
9  }
```

branchName

getInfo

Compilation Error: non-static var used in static context

Expected Usage: Bank.getInfo

not a context object → Bank.branchName

not an object!

non-static

Fix 1

```
1  public class Bank {
2      private string branchName;
3      public String getBrachName() { return this.branchName; }
4      private static int nextAccountNumber = 0;
5      public static String getInfo() {
6          nextAccountNumber++;
7          return this.branchName + nextAccountNumber;
8      }
9  }
```

↳ remark the usage of non-static var.

↳ return value of global counter.

Fix 2

```
1  public class Bank {
2      private static string branchName;
3      public String getBrachName() { return this.branchName; }
4      private static int nextAccountNumber = 0;
5      public static String getInfo() {
6          nextAccountNumber++;
7          return this.branchName + nextAccountNumber;
8      }
9  }
```

→ not a good design :(

branch name should be instance-specific.

Example: Reference to this

recursive type

```
public class Person {
  private String name;
  private Person spouse;
  public Person(String name) {
    this.name = name;
  }
  public void marry(Person other) {
    if ( /* marriage is legal */ ) {
      this.spouse = other;
      other.spouse = this;
    } else { /* Error */ }
  }
}
```

spouse is null by default.

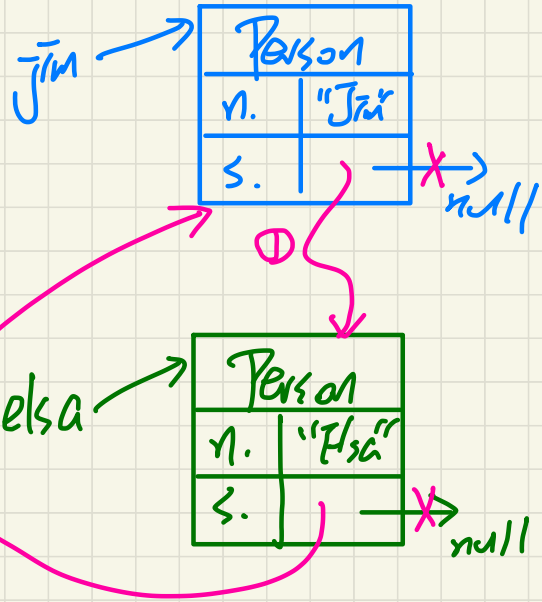
* this.spouse == null && other.spouse == null

this / other

① jim.spouse = elsa;

② elsa.spouse = jim;

other / this




```
Person jim = new Person("Jim");
Person elsa = new Person("Elsa");
jim.marry(elsa);
```

C.O. other

Math

(conjunction, and) $\wedge$

(disjunction, or) $\vee$

(negation) $\neg$

Programming

`&&`

`||`

`!`

short-circuit evaluation.

Exercise

illegal ≡ !(legal).

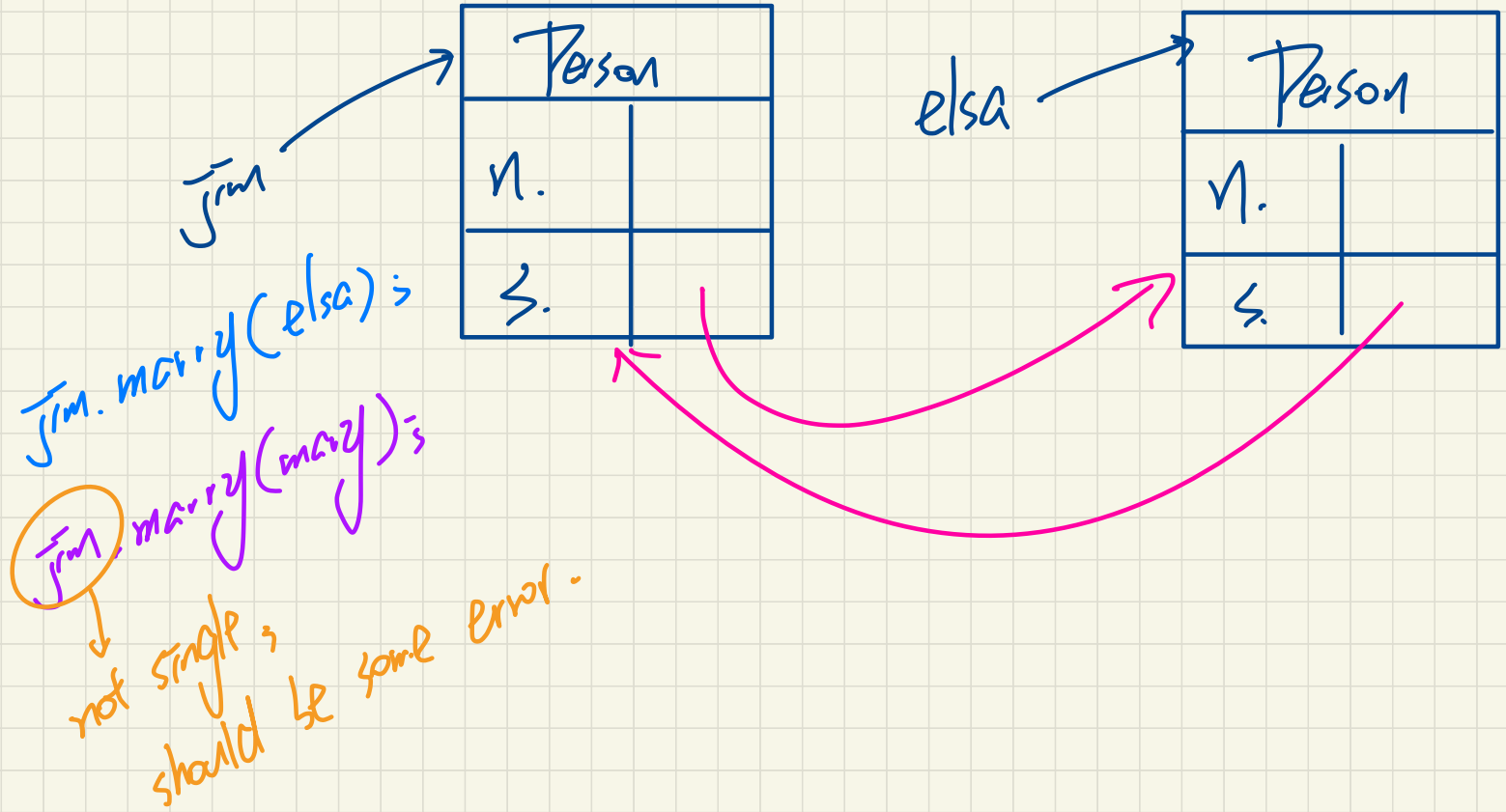
De Morgan

this.spouse == null
other.spouse == null

¬(P ∧ Q) ≡ ¬P ∨ ¬Q

¬(P ∨ Q) ≡ ¬P ∧ ¬Q

```
public void marry (Person other) {
    if (* proposed marriage is illegal) { /* error */ }
    else {
        ①
        ②.
    }
}
```


Person
n.
s.
Jim
elsa
Person
n.
s.
Jim.marry(elsa);
Jim.marry(mary);
Jim
not single;
should be some error.

Reference-Typed Return Values


```
public class Point {
   /* A mutator modifying the context Point object */
   public void moveUp (double i) {
      this.y = this.y + i;
   }

   /* An accessor returning a new Point object */
   public Point movedUpBy(double i) {
      Point np = new Point(this.x, this.y);
      np.moveUp(i);
      return np;
   }
}
```


```
public class PointTester {
   public static void main(String[] args) {
      Point p1 = new Point(2.5, -3.6);
      p1.moveUp(7.8);
      Point p2 = p1.movedUpBy(6.4);
      System.out.println(p1 == p2);
   }
}
```

Anonymous Objects


```
1 double square(double x) {
2   double sqr = x * x;
3   return sqr; }
```

```
1 double square(double x) {
2   return x * x; }
```

```
1 Person getP(String n) {
2   Person p = new Person(n);
3   return p; }
```

```
1 Person getP(String n) {
2   return new Person(n); }
```

Exercise

```
class Member {
  private Order[] orders;
  private int noo;
  /* constructor ommitted */
  public void addOrder(Order o) {
    this.orders[this.noo] = o;
    this.noo++;
  }
  public void addOrder(String n, double p, double q) {



  }
}
```