CMSC 132: OBJECT-ORIENTED PROGRAMMING II

Java Language Constructs II

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Announcements

- Regarding TA Room Usage
  - No food or drinks are allowed in the TA room
  - Please do not rearrange the furniture
  - No independent studying (not a study lounge)
  - Please be considerate of fellow students who need help. Once you have spoken with your TA please clear out to allow other students the same opportunity
- Link with information at
  - http://www.cs.umd.edu/~nelson/taRoom/

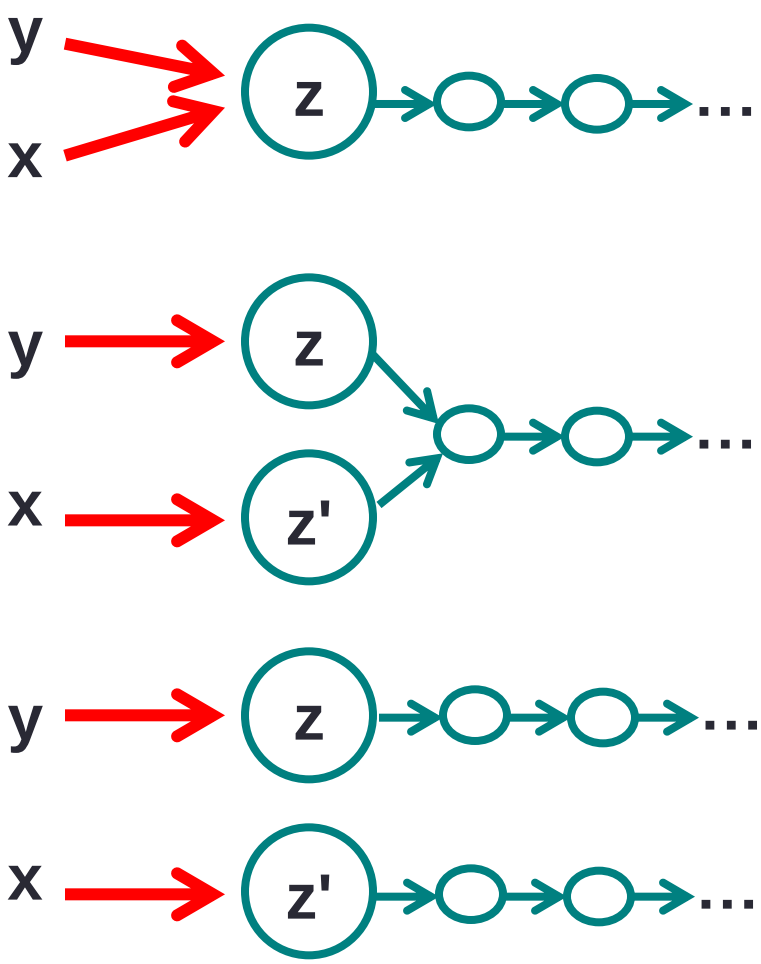
Comparator Interface

- Comparator
  - public int compare(T a, T b)
    - Negative if a < b, 0 if a == b, positive if a > b
- Properties
  - Imposes total ordering on objects of a class
  - Provide alternatives to natural ordering
  - Supports generics
    - Example: class myC implements Comparator<Foo>{ … }
  - Use as parameter for sort function
    - Example: Collections.sort(myFooList, new myC( ));
- **Example:** comparatorExample

Three Levels of Copying Objects

Assume y refers to object z

1. Reference copy
   - Makes copy of reference
   - x = y;
2. Shallow copy
   - Makes copy of object
   - x = y.clone( );
3. Deep copy
   - Makes copy of object z and all objects (directly or indirectly) referred to by z



Cloning

- Cloning
  - Creates identical copy of object using clone( )
- Cloneable interface
  - Supports clone( ) method
  - Returns copy of object
    - Copies all of its fields
    - Does not clone its fields
    - Makes a shallow copy
- **Example:** cloning package

Garbage Collection

- **Concepts**
  - All interactions with objects occur through reference variables
  - If no reference to object exists, object becomes garbage (useless, no longer affects program)
- **Garbage collection**
  - Reclaiming memory used by unreferenced objects
  - Periodically performed by Java
  - Not guaranteed to occur
  - Only needed if running low on memory

Destructor

- Description
  - Method with name finalize()
  - Returns void
  - Contains action performed when object is freed
  - Invoked automatically by garbage collector
    - Not invoked if garbage collection does not occur
  - Usually needed only for non-Java methods
- Example

```
class Foo {
    void finalize() { … }          // destructor for foo
}
```

Initialization Block

- Definition
  - Block of code used to initialize static & instance variables for class
- Motivation
  - Enable complex initializations for static variables
    - Control flow
    - Exceptions
  - Share code between multiple constructors for same class

Initialization Block Types

- Static initialization block
  - Code executed when class loaded
- Initialization block
  - Code executed when each object created
  - (at beginning of call to constructor)
- Example

```
class Foo {
    static { A = 1; }          // static initialization block
    { A = 2; }                 // initialization block
}
```

Variable Initialization

- Variables may be initialized
  - At time of declaration
  - In initialization block
  - In constructor
- Order of initialization
  1. Declaration, initialization block
     (in the same order as in the class definition)
  2. Constructor

Variable Initialization – Example

```
class Foo {
    static { A = 1; }          // static initialization block
    static int A = 2;          // static variable declaration
    static { A = 3; }          // static initialization block
    { B = 4; }                 // initialization block
    private int B = 5;         // instance variable declaration
    { B = 6; }                 // initialization block
    Foo() {                    // constructor
       A = 7;
       B = 8;
    }                          // now A = 7, B = 8
}           // initializations executed in order of number
```

Static Block Example

```
public class Person {
  …
  // STATIC INITIALIZATION CREATES OBJECT ONCE
  private static final Date MILLENIUM;
  static {
    Calendar gmtCal = Calendar.getInstance(
      TimeZone.getTimeZone("GMT"));
    gmtCal.set(2000,Calendar.JANUARY,1,0,0,0);
    Date MILLENIUM = gmtCal.getTime();
  }
  public boolean bornBefore2000(){ // FASTER!
    return birthDate.before(MILLENIUM);
  }
}
```