

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`

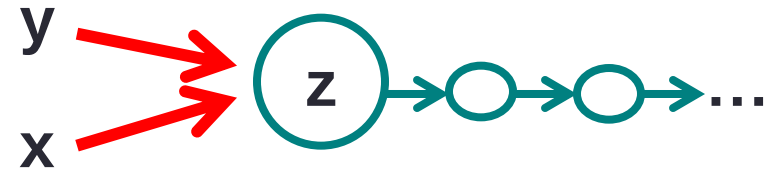
Three Levels of Copying Objects

Assume y refers to object z

1. Reference copy

- Makes copy of reference

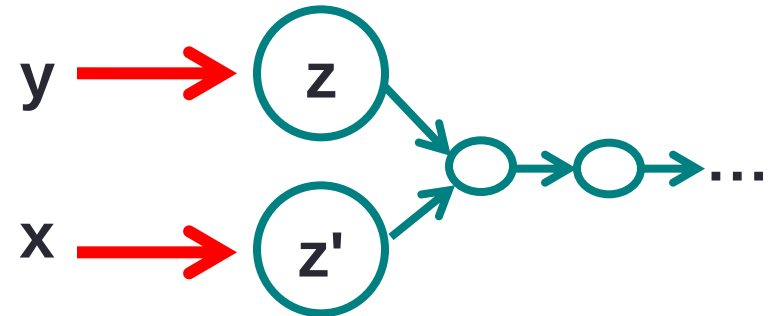
- `x = y;`



2. Shallow copy

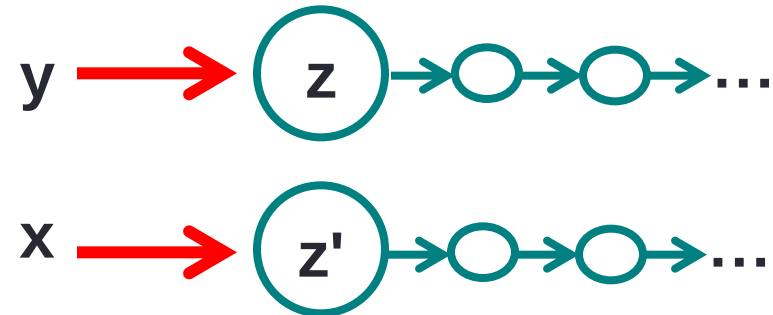
- Makes copy of object

- `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);  
    }  
}
```