C++ idioms/general concepts

- **Genericity**
  - Templates, STL, containers, algorithms

- **Copy/Assignment/Memory**
  - Deep copy model, memory management “required”

- **Low-level structures**
  - C-style arrays and strings compared to STL, Tapestry

- **const**
  - Good for clients, bad for designers/coders?

- **From C to C++ to Java**
  - function pointers, function objects, inheritance
C++ idioms

- **What happens with the statement** `myDay = d;`?
  - assignment is memberwise unless operator `=` overloaded
  - copy constructor used in passing parameters by value
- **If you need one of:** destructor, assignment operator, copy constructor, you need all of them
  - heuristic only: managing resources other than memory
  - preventing objects from being copied
  - what about non-copyable state, e.g., stream

- In assignment operator, watch for self-assignment
- Study implementation of string/vector
copy constructor

- **Used for “first-time” creation**
  
  ```cpp
  Date d(1,1,2000);
  Date copy(d);
  ```

- **Used for pass-by-value**
  
  ```cpp
  DoStuff(Date d);
  //…
  Date first(1,1,2000);
  DoStuff(first);
  ```

- **what about use of myLength in code as opposed to length()?**

```cpp
template <class Item>
tvector(const tvector<Item> & vec)
  // precondition: Item supports assignment
  // postcondition: return copy of vec
  {
    // allocate storage
    myList = new Item[myLength=vec.myLength];
    assert(myList != 0);
    // copy elements
    for(int k = 0; k < vec.myLength; k++)
    {
      myList[k] = vec.myList[k];
    }
  }
```
Assignment operator

- We want to have deep copy when assigning as well as when we copy
  ```
  Object x(23,4);
  Object y;
  y = x;              // assignment operator
  Object z = x;       // copy constructor!!!
  z = y = x;          // how does this work?
  ```

- Assignment operator returns *this
  - Won’t be const reference return, will be reference

- Assignment operator checks for not assigning to self
  - Can assign to self via aliasing, e.g., pass-by-reference

- Assign to every data member (deep copy as needed)
- See tvector for details
Destructor

- If you need copy constructor, you need assignment operator, and you need destructor
- What is purpose of destructor?
  - Free resources
  - What’s a resource: memory, files, network connections
- When is the destructor called?
  - Automatically when a stack object goes out of scope
  - When you call delete on a heap object
- What’s the problem with this “automatic destruction”?
  - It’s not automatic, it’s fraught with problems getting it right
- What about yahoo and the rolling reboot?