CS 161
Intro to CS I

C++ Strings, Errors, and Debugging
Odds and Ends...

- Last week to demo Assignment 1!
- Sign up for demoing Assignment 2 early!!
- Work on Assignment #3 Design due Sunday!!!
Documentation

- http://cplusplus.com/
```cpp
#include <iostream>
#include <string>  //location of C++ string object
#include <cstdlib> //location of atoi()/ASCII to integer
using namespace std;

int main() {
    string mssg="hello";  //can assign a string literal to string object
    cout << "Enter a number: ";
    cin >> mssg;
    int i;  //declare it outside the for because we use if after the for
    for(i=0; i<mssg.length(); i++) {
        //if a character is not within the range of '0' - '9' on ASCII chart,
        //then it isn't a positive integer
        if(!(mssg.at(i) >= '0' && mssg.at(i) <= '9')) {
            cout << "bad input" << endl;
            break;
        }
    }
    if(i==mssg.length())  //if all the characters are digits in string, then...
        cout << atoi(mssg.c_str()) << endl;  //change it to an integer
    return 0;
}
Programming Errors

• Syntax errors
  – Misuse of C++ language
  – How are they caught?

• Logic errors
  – Doesn’t perform task correctly (aka. bugs)
  – How are they caught?

• Runtime errors
  – Stops your program from running
  – How are they caught?
Syntax Error Examples

- Missing main function
- Use of identifier not declared
- Misspelled Words
- Forget a Semicolon
- Forget Required Keyword
- Missing quote, curly brace, and parenthesis
- Use of single quotes instead of double
Logic Error Examples

• Poorly written programs
  – Add instead of subtract (incorrect operation)
  – Using last two digits for date
  – Same error message for different errors
  – Program that never ends
  – Add one to the largest integer
Runtime Error Examples

• Open a file that doesn’t exist
• Segmentation fault/Core dump
  – Infinite loop that eats memory
  – Divide by variable that is zero
  – Access memory bad memory
Debugging Errors

• Syntax:
  – READ compiler errors (pay attention to line #)
  – Use google to search for error

• Logic/Runtime
  – Use std::cout to find where the code is breaking
    • Print variable values
    • Print indicator messages
  – Trace through the code
  – Comment out code
Demo...
Decomposition

• Divide Problem (task) Into Subtasks
  – Procedural Decomposition
  – Examples: cooking, cleaning, etc.

• Incremental Programming
  – Iterative Enhancement (Stepwise Refinement)

• Examples: Replicating Code
Procedural Decomposition

• Functions
  – int main() { }  
  – User defined
    void draw_box() { }  

• Function Call
  – draw_box();
#include <iostream>
using std::cout;

int main() {
    cout << “+-------+
”;
    cout << “|       |
”;
    cout << “+-------+
”;
    cout << “|       |
”;
    cout << “+-------+
”;
    cout << “|       |
”;
    return 0;
}

void draw_box();  //Declare function

int main() {
    draw_box();  //Use function
    draw_box();
    return 0;
}

void draw_box() {  //Define function
    cout << “+-------+
”;
    cout << “|       |
”;
    cout << “+-------+
”;
}
Functions Calling Other Functions

#include <iostream>

void draw_box();
void draw_top_bottom();
void draw_sides();

int main() {
    draw_box();
    return 0;
}

void draw_box() {
    draw_top_bottom();
    draw_sides();
    draw_top_bottom();
}

void draw_top_bottom() {
    std::cout << “+-------+\n”;
}

void draw_sides() {
    std::cout << “|       |\n”;
}
Generalization

• Does a function make a task more specific or more general?
  – Justification
  – Examples
Functions

• What is a function?
  – Block of code to perform action/subroutine

• When have we seen functions already?
  – Predefined

• What is the purpose?
  – Reduce
  – Reuse
  – Readability
Predefined Functions

- sqrt()
- pow()
- abs()
- rand()
- srand()

What is the difference b/w srand(), rand(), and pow()/abs()/sqrt()?
void Functions

• Doesn’t return a value
• Still has arguments/parameters

Get into groups of 4-5
• Write a **void check_positive_int ()**?
• Is it more useful to return a value?
Programming Demo
Programming Demo