Odds and Ends

• Assignment 1 due Sunday, 11:59pm on TEACH
• Recitation Quiz 1 due Monday, 11:59pm by email
• Read Chap. 1 of online books!!!
• Assignments must compile and run on ENGR!
• Demos start next week (no laptop required).
• Sign-up for demo on home page, after you submit your assignment.
• Don’t be scared!!!!
Decimal, Binary, & Hex

• Decimal
  – Powers of 10

• Binary
  – Powers of 2

• Base X to Base 10 conversion
  – 32 (base 10): 3*10^1 + 2*10^0 = 32 (base 10)
  – 100000 (base 2): 1*2^5 + 0*2^4 + 0*2^3 + 0*2^2 + 0*2^1 + 0*2^0 = 32 (base 10)
  – How do we express 35 (base 10)
    • base 2
    • base 16
More Binary

• What is each digit called?
• What is a Byte? 8 bits
• How many numbers can be expressed in a Byte?
  – Signed/Unsigned
  \[2^8 = 256\]
  \[(2^8 - 1)\]
  \[0 - 255\] unsigned
  • What is the smallest number?
  pos \[0 = 127\]
  \[2^7\]
  1st bit is sign, \[0\] is pos
  neg \[-1 = -128\]
  \[2^7\]
  lose bit
  lose bit
  • What is the largest number?
Programming

• Writing **code** that a computer can **execute**
  – Does that mean we have to write in binary?

• High-level language
  – Translated Continuously during runtime
    • Interpreted
    • Just in time compilation/caching
  – **Translated Prior/Ahead of time to runtime**
    • High-level -> machine language
    • High-level -> intermediate language
C++ Programming Environment

- Type a program in a .cpp file, `vim hello.cpp`
- Compile program file, `g++ hello.cpp -o hello`
- Run the compiled version, `hello`
- Example: `hello.cpp`

```cpp
#include <iostream>
int main() {
    std::cout << "Hello CS 161 Class!!!";
    return 0;
}
```
Our first C++ program!

• Libraries
  – Example: #include <iostream>

• Functions
  – Perform particular action/computation
  – Requires special function: **main**
    • int main() { .... }

• Statements
  – Ended by semicolon
  – Examples:
    • std::cout << “Hello World”;
    • return 0;
Comments

• Ignored by compiler
• Comment a block of code: /*…..*/
• Comment one line of code: //
• Why use these?
• What are you required to have right now?
  – Header at beginning of program
  /**************************************************
  ** Program: hello.cpp
  ** Author: Jennifer Parham-Mocello
  ** Description: This program prints hello world to the console
  ** Input: none
  ** Output: hello world text
  **************************************************/
More C++

• Programming Style: please read your class style guide
  – Program Header/Description
  – Placement of {}
  – Indentation: spaces vs. tabs
• String Literals (Strings)
  – Quotation marks not single quotes!
    • INCORRECT: std::cout << ‘Hello World’;
  – Do not span more than one line!
    • INCORRECT: std::cout << “Hello World”;

Be consistent.
More C++

• Escape Sequences
  – Display special characters
  – Use backslash, \, before special character to print

• Examples:
  std::cout << "\"Hello World\"\n";

• Refer to book for common escape sequences.
```cpp
#include <iostream>  // this is to print and read info
#include <climits>  // this is to access INT_MAX

using namespace std;

int main() {
    // can use \n for newline, but endl flushes buffer and prints newline
    cout << INT_MAX << '\n';
    return 0;
}
```
Data Type

• What is data?
  – Information
  – Ex: std::cout << "Hello World!" << std::endl;
  – Simple value
    • Literals, e.g. 23, 79.5, “Hello”, etc.

• What is a data type?
  – Description of the kind of information
    • Primitive Data
    • User Created/Data Structures – (we will cover later)
```cpp
#include <iostream>  //this is to print and read info
#include <climits>   //this is to access INT_MAX
#include <cmath>     //allows you to use pow

using namespace std;

int main() {
    cout << INT_MAX << endl;
    cout << -1*pow(2, 8-1) << endl; //signed min in 8 bits
    return 0;
}
```
C++ Primitive Types

- **char, double, float, int, long, short, bool**
- **Fundamental**
  - `int`: whole numbers, e.g. 45, -89, 0
  - `double`: real numbers, e.g. 2.612, -30.5, 2.3e5
  - `char`: characters, e.g. ‘A’, ‘&’, ‘x’, ‘\’
- **Signed and Unsigned**
Variables

• What is a variable?
  – Memory location with name and type to store value

• What is a declaration?
  – Statement requesting variable w/ name and type
  – Examples:
    double height;
    int age;

By default, signed