CS 161
Intro to CS I
Beginning to Program
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): $3\times10^1 + 2\times10^0 = 32$ (base 10)
  – 100000 (base 2): $1\times2^5 + 0\times2^4 + 0\times2^3 + 0\times2^2 + 0\times2^1 + 0\times2^0 = 32$ (base 10)
  – How do we express 35 (base 10)
    • base 2
    • base 16
More Binary

• What is each digit called?
• What is a Byte?
• How many numbers can be expressed in a Byte?
  – Signed/Unsigned
• What is the smallest number?
• 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
  **************************************************/
Demo...
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”;}
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.
Demo...
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)
Demo...
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;
Demo...
Variables/Identifiers

• Identifier: name given to item in program
  – Ex. Variables and Functions
  – Start with letter
    • Letters include: upper-case, lower-case, underscore (_)
  – Followed by sequence of letters and digits
  – Good examples: hiThere, two_plus_two, _hello
  – Bad examples: 5dogs, hi-there, hello there

• Can’t Use Keywords, refer to book...
Variables

• How do we get a value in the variable?
  – Assignment Statement
    int age;
    age = 20;
    Or
    int age = 20;
  – = IS NOT equal to!!!!!
    • “gets” or “is assigned”
Printing Variables

• C++: cout
  – Example:
    std::cout << “The integer value is: ” << value;
  – What about the newline?
Constants

• What is a constant?

• How do we define a constant?
  – Use of a macro
    • \#define
    • Placed at top of program
    • No semicolon at end
    • Example: \#define MAX_SIZE 100
  – Use of const
    • Same as declaring variable but const
    • Example: const int MAX_SIZE = 100;
Intro to Macros

• C++: `<climits>`

  (Note that the values listed are not the values on our system!!)
  – INT_MAX
  – INT_MIN
  – LONG_MAX
  – LONG_MIN
  – SHRT_MAX
  – SHRT_MIN

• Remember unsigned too...
Demo...