CS 161
Intro to CS I
Beginning to Program
More C++

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

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

• Refer online for common escape sequences: http://en.cppreference.com/w/cpp/language/escape
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:
  http://en.cppreference.com/w/cpp/keyword
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/
Reading Into Variables

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

• C++: cin
  – Example:
    std::cin >> value;
Demo...
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>`
• Use MIN and MAX macros from library
  (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...
Expressions

• What is an expression?
  – Set of operations producing a value
    • Combining literal values
      $12 \times 4 + 6 \times 10$ vs. $((12 \times 4) + 6) \times 10$
    • Combining variables
      $\text{var1} \times \text{var2} + \text{var3} \times \text{var4}$ vs. $((\text{var1} \times \text{var2}) + \text{var3}) \times \text{var4}$
Expressions cont.

- Pieces of an Expression:
  - Operators
    - Indicate operation, e.g. +, *, /, -, %
  - Operands
    - Values in the expression
  - Evaluation
    - Process of obtaining results from operations on operands
Arithmetic Operators

• Add
  34 + 23
• Subtract
  34 - 23
• Multiply
  2 * 23
• Divide
  40 / 10
• Remainder/Mod
  34 % 5
Precedence

• What is precedence?
  – Binding power of operator
  – (\(*\), /, \%) vs. (+, -)

• How do we override precedence?
  – Parenthesis!

• Examples:
  12 * 4 + 6 * 10 vs. ((12 * 4) + 6) * 10
Arithmetic

• Integer Arithmetic
  
  ```
  std::cout << 3/8;   /*prints 0*/
  std::cout << 34/5;  /*prints 6*/
  int age=5;
  std::cout << age/2; /*prints 2*/
  ```

• Floating Point Arithmetic
  
  ```
  std::cout << 34.0/5.0;  /*prints 6.8*/
  std::cout << 3.0/8;    /*prints .375*/
  float years=2.0;
  std::cout << age/years; /*prints 2.5*/
  ```
Type Casting

• Casting
  std::cout << age / (int) years; /*prints 2*/
  std::cout << (int) (age / years); /*prints 2*/
  std::cout << (float) age / 2; /*prints 2.5*/

• What is wrong with these?
  std::cout << (int) age / years; /*prints 2.5*/
  std::cout << (float) (age/2); /*prints 2.0*/
Demo...