CS 161
Intro to CS I

Variables and Operators
Odds and Ends

• Assignment 2 posted
• Recitation Quiz 2 posted
• Assignments must compile and run on ENGR!
• Demo Assignment 1 (no laptop required).
Reading

• Through Variables:
  – Chap 1-4 (Halterman)
  – pg. 1-34 (Soulie)
  – Chap 1-2.5 (Wikibook)
  – Lecture 1-2 (Miller)
  – Part 1-2.6 (Gray)
  – Chap. 1-2 (Downey)
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;
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 store a value in the variable?
  – Assignment Statement
    ```cpp
    int age;
    age = 20;
    Or
    int age = 20;
    – = IS NOT equal to!!!!!
    • “gets” or “is assigned”
Demo...
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  
  http://www.cplusplus.com/reference/clibrary/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...
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
      var1 * var2 + var3 * 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
Arithmetic

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

• Floating Point Arithmetic
  
  ```cpp
  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*/
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
Demo...
Additional Operators

• Common operation: fetch/store same variable
  var = var + 2;  // increment variable contents
  var = var * 2;  // double variable contents
  – Assignment/operator combination (all ops supported):
    var += 2;
    var *= 2;

• Pre/Post increment/decrement: ++ and –
  – Example: age++ vs. ++age
Demo...