ECE/CS 151
Intro to Programming I

Expressions and User Input

Chap. 2.5 – 2.8
Issues to Address

• Assignment #1
  – Base conversions
  – Easter dinner section
  – LONG_MAX example
  – pow() returns a double
  – Extension??? (Due Thursday, 4/12, 11:59pm)
LONG_MAX Example

```c
#include <stdio.h>
#include <limits.h>
#include <math.h>

int main() {
    long num;
    printf("The value for LONG_MAX is: %ld\n", LONG_MAX);
    num = (long) (pow(2, (sizeof(long) * 8) - 1) - 1);
    printf("A long integer takes up %d bytes\n", sizeof(long));
    printf("The LONG_MAX by direct computation: %ld\n", num);
    return 0;
}
```
Expressions

• What is an expression?
  – Set of operations producing a value
    • Combining simple values
      12 * 4 + 6 * 10 vs. ((12 * 4) + 6) * 10
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**
  - $2 \times 23$
- **Divide**
  - $40 / 10$
- **Remainder/Mod**
  - $34 \% 5$
Arithmetic

• Integer Arithmetic
  printf(“%d”, 3/8);  /*prints 0*/
  printf(“%d”, 34/5);  /*prints 6*/
  printf(“%f”, 34/5);  /*prints garbage BEWARE*/

• Floating Point Arithmetic
  printf(“%f”, 34.0/5.0);  /*prints 6.8*/
  printf(“%f”, 3.0/8);  /*prints .375*/
  printf(“%f”, 3/8.0);  /*prints .375*/
  printf(“%d”, 34.0/5);  /*prints garbage BEWARE*/
Type Casting

• Casting
  
  ```c
  printf("%d\n", 34 / (int) 5.0); /*prints 6*/
  printf("%d\n", (int) (34 / 5.0)); /*prints 6*/
  printf("%f\n", (float) 34 / 5);  /*prints 6.8*/
  ```

• What is wrong with these?
  
  ```c
  printf("%d\n", (int) 34 / 5.0); /*prints garbage*/
  printf("%f\n", (int) 34 / 5.0); /*prints 6.8*/
  printf("%f\n", (float) (34/5));  /*prints 6.0*/
  ```
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
int main() {
    //declare variables
    double height;
    double weight;
    double bmi;

    //compute BMI
    height = 70.0;
    weight = 195.0;
    bmi = weight / (height*height) * 703;

    //print results
    printf("Current BMI: %f\n", bmi);

    return 0;
}
How do we read into a variable?

• Declare a variable
• Read value from user and store at address
• How do we do this?

```c
#include <stdio.h>
int main() {
    int x;
    scanf("%d", &x);
    printf("%d\n", x);
    return 0;
}
```

& means "Address Of"
Program Demo

Read height and weight

```c
#include <stdio.h>

int main() {
    // declare variables
    double height;
    double weight;
    double bmi;

    // compute BMI
    // height = 70.0;
    // weight = 195.0;
    printf("Please enter your height: ");
    scanf("%lf", &height);

    printf("Please enter your weight: ");
    scanf("%lf", &weight);

    bmi = weight / (height*height) * 703;

    // print results
    printf("Current BMI: %f\n", bmi);

    return 0;
}
```