CS 161
Intro to CS I
Expressions and User Input
Chap. 1.2 - 1.5
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 * 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
  printf(“%d
”, 34 / (int) 5.0); /*prints 6*/
  printf(“%d
”, (int) (34 / 5.0)); /*prints 6*/
  printf(“%f
”, (float) 34 / 5);   /*prints 6.8*/

• What is wrong with these?
  printf(“%d
”, (int) 34 / 5.0); /*prints garbage*/
  printf(“%f
”, (int) 34 / 5.0); /*prints 6.8*/
  printf(“%f
”, (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 in C?

• 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”
How do we read into a variable in C++?

• Declare a variable
• Read value from user and store at address
• How do we do this?
  
  ```
#include <iostream>
int main() {
    int x;
    cin >> x;
    cout << x;
    return 0;
}
```
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;
}
```
Quiz #1

• Discuss Assignment #1.

• Design an algorithm for the solution:
  – Why use the sizeof() function in your direct computation?
Quiz #1

1. Get into groups of 4-5.
2. Discuss Assignment #1.
3. Design an algorithm for the solution:
   - Why use the `sizeof()` function in your direct computation?

```cpp
#include<iostream>
#include<stdio.h>
#include<math.h>
#include<cmath>
#include<climits>

int main() {
    // Prints the maximum signed long that can be represented in C and C++
    printf("The long max is: \%ld\n", ((unsigned long) pow(2, sizeof(long)*8-1)) - 1);
    std::cout << ((unsigned long) std::pow(2, sizeof(long)*8-1)) - 1 << std::endl;

    // Prints the maximum unsigned long that can be represented in C++ and C
    std::cout << "The unsigned long max is: " << ULONG_MAX << std::endl;
    printf("\%lu\n", ULONG_MAX);
}
```

"largest_demo.cpp" 15L, 515Cc 11,0-1 All
Quiz #1

flip3 ~ 157% g++ lar
largest_demo.cpp largest_int.c largest_int.cpp
flip3 ~ 157% g++ largest_demo.cpp
flip3 ~ 158% ./a.out
The long max is: 9223372036854775807
9223372036854775807
The unsigned long max is: 18446744073709551615
18446744073709551615
flip3 ~ 159%