CS 161
Intro to CS I

Conditional Statements
Odds and Ends

• Assignment #2 posted
• Get Assignment #1 demoed
• Read about conditionals (if/else statements)
```cpp
#include <iostream>
#include <limits.h> //climits
#include <cmath>    //math.h

using namespace std;

int main() {
  unsigned int x = UINT_MAX; //unsigned max can fit in unsigned variable
  int num_bits;
  int result = 0; //need to start the result with zero, otherwise garbage
  int bin_num;

  cout << x << endl; //print value in x
  cout << "library int max: " << INT_MAX << endl;

  cout << "Give me num bits: ";
  cin >> num_bits;
  //typecast pow because it gives a floating point num back
  //calculate largest signed, which can be max 64 bits
  cout << (long) pow(2, num_bits - 1) - 1 << endl;
  //calculate largest unsigned, which can be max 64 bits
  cout << (unsigned long) pow(2, num_bits) - 1 << endl;

  result = result + bin_num % 10 * 1; //get the value in 1s place to calc result
  bin_num = bin_num / 10; //since you processed the digit, get rid of last digit

  return 0;
}
```
New Operators for Expressions

• What if you have the statement `var = var + 1;`
  `var += 1; /*Add operand on right to var*/`
  `var++; /*Increment var by one*/`

• What if you have the statement `var = var - 5;`
  OR `var = var + var;`
  `var -= 5;`
  `var += var;`

• Pre vs. Post increment: `++var` vs. `var++`
```cpp
#include <iostream>
#include <limits.h> //climits
#include <cmath>    //math.h

using namespace std;

int main() {
    int result = 0;   //need to start the result with zero, otherwise garbage
    int bin_num;

    cout << "enter bin num: ";
    cin >> bin_num;

    //result = result + bin_num%10*1; //get the value in 1s place to calc result
    result += bin_num%10*1;   //get the value in 1s place to calc result
    //bin_num = bin_num/10;     //since you processed the digit, get rid of last digit
    bin_num /= 10;             //since you processed the digit, get rid of last digit

    int i = 1;
    cout << i++ << endl;      //print then increment
    //cout << ++i << endl;     //increment then print
    cout << i << endl;        //i is 2 after either cout
    return 0;
}
```

"main.cpp" 23L, 734C written
Conditionals

• https://code.org/educate/resources/videos
Decisions in Life

• What is a decision?
• When do we make decisions?
• How do we make decisions?
  If it is sunny today
    then I’ll go to the beach and fly a kite
  Else if it is raining today
    then I’ll stay inside and read a book
  Else if it is snowing
    then I’ll go to the mountains to ski
Decisions within Decisions

• What happens if there is no wind at the beach?
• How does this change our decisions?
  If it is sunny today
    then I’ll go to the beach
    if it is windy at the beach
      then I’ll fly a kite
    if it is not windy at the beach
      then I’ll walk on the shore
Flow chart for decisions

Start

- Is it sunny?
  - Yes: Go to beach
  - No: Is it raining?
    - Yes: Read book
    - No: Go outside

- Is it windy?
  - Yes: Fly kite
  - No: Walk on beach
Decisions in our programs

• Use an if/else
  if (<expression>) {
    <statement>;
    ...
    <statement>;
  }
  else {
    <statement>;
    ...
  }

Part of this decision when it's true
What is the <expression>?

Could be a relational expression:
<expression> <relational op> <expression>

- **Relational Ops**
  - == - equal to
  - != - not equal to
  - < - less than
  - > - greater than
  - <= - less than or equal to
  - >= - greater than or equal to
Examples

- if(2 + 1)  //expression
- if(2 - 4)  //expression
- if(2 - 2)  //expression
- if(4 == 4)  //expression relational op expression
- if((2+1) == 4)  //expression relational op expression
- if(4.1 != 4)  //expression relational op expression
- if(3 <= 4)    //...
- if(4 >= 4)
- if(3.5 > 4)
- if(4 < 4)
- if(3+2*2 > 9)
- if((3+2)*2 > 9)
Logical Operators

- **AND:** if((1>2) && (2<5))
- **OR:** if((1>2) || (2<5))
- **NOT:** if(!(1>2) && (2<5))

- **Precedence of Operators:** refer to book

And

T T & & T T
F T U E F F
F F O E T F F O F

OR

T T I I I T F F I F
T T I I F F I F

T F I I I T T I F
T F I I I T T I F

C++ If/Else Syntax...

```cpp
x = 0
y = 1

if( x > y) {
    cout << “X is greater than Y” << endl;
}
else {
    cout << “X is less than Y” << endl;
}

• When does this logic fail?
```
C++ If/Else...

```c++
if( x > y) {
    cout << “X is greater than Y” << endl;
}
else if( x < y) {
    cout << “X is less than Y” << endl;
}
else {
    cout << “X is equal to Y” << endl;
}
```
What are the curly braces for?

```cpp
if( x > y)
    cout << "X is greater than Y" << endl;
else if( x < y)
    cout << "X is less than Y" << endl;
else
    cout << "X is equal to Y" << endl;
```