CS 161
Intro to CS I

Finish Conditionals/Begin Loops
Odds and Ends

• Last week to demo Assignment 1
• Demo Assignment 2, extra slot
• Peer Reviews due Thursday night
• Assignment 3 posted, design due Sunday

• Questions?
Reflection

• Tell me what this program does...
```cpp
#include <iostream>
#include <climits>

using namespace std;

int main() {
    int input;

    cout << "Enter an integer: ";
    cin >> input;

    // produces a description about the number entered by the user
    if(input%2)
        cout << "odd integer, ";
    if(input<(INT_MAX/2))
        cout << "less than half the largest an int can be!" << endl;
    else
        cout << "less than half the largest an int can be!" << endl;
    else
        cout << "even integer, ";
    if(input<(INT_MAX/2))
        cout << "less than half the largest an int can be!" << endl;
    else
        cout << "greater than half the largest an int can be!" << endl;

    return 0;
}
```
Logical Operators

• AND
• OR
• NOT

Are all logical operators binary?
What is short circuiting?
When might you use it?
We can use a switch...

```java
switch( <expression> ) {
    case <const-expr>:  
        <statement>; 
        ...
    case <const-expr>:  
        <statement>; 
        ...
    default:  
        <statement>; 
        ...
}
```
C++ Switch Example

```cpp
switch( x ) {
    case 0:
        std::cout <<"X is zero";
        break;
    case 1:
        std::cout <<"X is one";
        break;
    case 2:
        std::cout <<"X is two";
        break;
    default:
        std::cout <<"You have entered an invalid number!";
}
```
C++ Switch Example

```cpp
switch( x ) {
    case 0:
    case 1:
        std::cout << "X is zero or one";
        break;
    case 2:
        std::cout << "X is two";
        break;
    default:
        std::cout << "You have entered an invalid number!";
}
```
Multiple Decisions

• What if I want to make these same decisions for the whole year or while we can still ski?
  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
    else if it is not windy at the beach
      then I’ll walk on the shore
  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

• Repeat the process for 365 days
• Repeat the process while I can still ski 😊
How do we do this for a year?

• Repetition: for loops
  – Semantics
    • Repeat for a specific # of iterations w/ starting point, ending point, and a way to get from start to end
  – Syntax
    for(x=1; x <= 365; x++) {
      <statement>;
      <statement>;
      ...
    }
How do we do this while we can still ski?

• Repetition: while loops
  – Semantics
    • Repeat while something continues to hold true
  – Syntax
    bool can_ski=true;
    while(can_ski == true) {
      //go skiing
      cout << “Can you still ski? (0-false, 1-true)” << endl;
      cin >> can_ski;
    }
The for Loop Pattern

for(<variable> = n; <variable> <= p; <variable>++)
{
    <statement>;
    ...
}
for(<variable> = n; <variable> >= p; <variable>--)
{
    <statement>;
    ...
}
The for Loop

```
for(x=1; x <= 365; x++) {
    <statement>;
    <statement>;
    ...
}
```

Starting point: Initialization
The for Loop

```java
for(x=1; x <= 365; x++) {
    <statement>;
    <statement>;
    ...
}
```

Ending point: Continuation Test
The for Loop

for(x=1; x <= 365; x++) {
    <statement>;
    <statement>;
    ...
}

• What do you notice about order?
The for Loop

for (x=1; x <= 365; x++) {
    <statement>;
    <statement>;
    ...
}

• Same as x = x+1
• What about x = x + 2?
The for Loop

for(x=1; x <= 365; x++) {
    <statement>;
    <statement>;
...
}

- What do you notice about order?
The for Loop

for(x=1; x <= 365; x++) {
    <statement>;
    <statement>;
    ...
}

Test is False: Execution after loop
The for Loop Examples

for(x=0; x <= 100; x++)
    cout << "hello world\n";
for(x=0; x < 100; x++)
    cout << "hello world\n";
for(x=-100; x <= -1; x++)
    cout << "hello world\n";
for(x=-100; x <= 100; x++)
    cout << "hello world\n";
The for Loop Examples

```cpp
for(x=1; x <= 1; x++) {
    cout << "hello world\n";
}
for(x=1; x < 1; x++) {
    cout << "hello world\n";
}
```

- Why is it better to use curly braces?
The while loop

for(x=1; x <= 100; x++)
    cout << "hello world\n";

VS.

int x=1;
while(x<=100) {
    cout << "hello world\n";
    x++;
}
Common Mistakes

```c
int x = 1;
while (x <= 100) {
    cout << "hello world\n";
    x++;
}
```

What if we forget this?
The do/while loop

```c
int x=1;
do {
    cout << "hello world\n";
    x++;
} while(x<=100);
```

• Difference b/w while and do/while?
Nested for Loops

for(x = 0; x < 10; x++) {
    for(y = 0; y < 10; y++) {
        cout << "hello world\n";
    }
}

• How many times is Hello World printed?
Reuse Variables

```cpp
for(x = 0; x < 10; x++) {
    cout << "The value of x is: " << x << endl;
}
for(x = 0; x < 10; x++) {
    cout << "The value of x is: " << x << endl;
}
```
int x;
for(x = 0; x < 10; x++) {
    for(x = 0; x < 10; x++) {
        cout << "The value of x is: " << x << endl;
    }
}

• What is the output from this nested loop?
Infinite Loops

```cpp
int x;
for(x = 0; x < 10; x++) {
    for(x = 0; x < 5; x++) {
        cout << "The value of x is: " << x << endl;
    }
}
```
Infinite Loops

```cpp
int x, y;
for(x = 0; x < 10; x++) {
    for(y = 0; y < 5; x++) {
        cout << "The value of x is: " << x << endl;
    }
}
```
Infinite Loops

int x, y;
for(x = 0; x < 10; x++) {
    for(y = 0; x < 5; y++) {
        cout << "The value of x is: " << x << endl;
    }
}


Infinite Loops

int x;
for(x = 1; x <= 10; x++) {
    cout << "The value of x is: " << --x << endl;
}