C++ If Construct

Instructor: Chi Tse (Ricky)

Making Decisions

- Computer can make decisions, such as:
  - Display a letter grade based on the numerical value
  - Display greeting Mr. or Ms. based on user 's gender
  - Display AM or PM based on time
  - Display advertising based on interest (google/facebook)
  - Check if user entered a matching username and password
  - (and much more…)
- So how do we get our programs to decide things?

If statement

- If something has happened, we can make computer to perform a task.

- Example:
  - If number is odd, print out that number is odd.
  - If grade is greater than 93, the student receives an A in class.
  - If password doesn't match, ask the user to enter it again.

If Statement Model

- Model:

```
if ( comparison_is_true )
{
        //do something here
}
```

Example:

```
if ( number % 2 == 1 )
{
        cout << number << " is odd." << endl;
}
```

Conditional Comparison

What I want to compare	Code in C++
Is x equal to y?	x == y
Is x not equal to y?	x != y
Is x less than y?	x < y
Is x less than or equal to y?	x <= y
Is x greater than y?	x > y
Is x greater than or equal to y?	x >= y

Single statement vs. Block of Code

- There is a shortcut build into if statements:
  - If you only have one instruction to execute
    (*ending with ;*)
  - You do not need to type out the { } enclosing curly braces

- Example:

```
if ( number % 2 == 1 )
    cout << number << " is odd." << endl;
```

If statement using a block of code

- Sometimes multiple instructions need to be executed if a condition is true, in which case the { } enclosing block MUST be provided.
- Suggestion: know both ways, and always use { }
- Example:

```
if ( number % 2 == 1 )
{
        cout << number;                 //first
        cout << " is odd." << endl;     //second
}
```

If not? Else what?

- If our initial query was not true, what else can we do?
- We simply do nothing

  or

- We can fall back to a default – else

  or

- We ask another question – else if

If / Else Model

- Model:

```
if (   comparison_is_true   )
{
      //do something here
}
else
{
      //do something else here
}
```

If / Else Example

- Example:

```
if ( number % 2 == 1 )
{
      cout << number << " is odd." << endl;
}
else
{
      cout << number << " is even." << endl;
}
```

If / Else If / Else Model

Model:

```
if ( comparison_is_true )
{
        //do something here
}
else if ( another_comparison_is_true )
{
        //do something else here
}
else
{
        //do yet something else here
}
```

Note: else if block can be repeated as many times as needed to detect all the conditions that needs to be picked up.

If / Else If / Else Model Example

Example:

```
if ( number % 3 == 0 )
{
        cout << number << " is divisible by 3." << endl;
}
else if ( number % 3 == 1 )
{
        cout << number << " has reminder of 1." << endl;
}
else
{
        cout << number << " has reminder of 2." << endl;
}
```

Chain of if / else if statements

- It seems like if and else if serve the same purpose
- Example 1, using if only:

```
if ( number % 3 == 0 )
        cout << "divisible by 3" << endl;
else if ( number % 3 == 1 )
        cout << "remainder of 1" << endl;
else if ( number % 3 == 2 )
        cout << "remainder of 2" << endl;
```

- What would be the output if number was 5?

Are if statements enough?

- Example 2, using only if statements :

```
if ( grade >= 97 )
        cout << "A+" << endl;
if ( grade >= 92 )
        cout << "A" << endl;
if ( grade >=90 )
        cout << "A-" << endl;
```

- What's this output if the grade is 100?

When chaining is required

- Example 2, using if and else if statements:

```
if ( grade >= 97 )
        cout << "A+" << endl;
else if ( grade >= 92 )
        cout << "A" << endl;
else if ( grade >=90 )
        cout << "A-" << endl;
```

- What's this output if the grade is 100?

Another chaining example

Multiple if statements may be chained by using if and else-if statements as follows :

```
if (x % 5 == 0)
   cout << "x is divisible by 5." << endl;
else if (x % 3 == 0)
   cout << "x is divisible by 3." << endl;
else if (x % 2 == 0)
   cout << "  x  is divisible by 2." << endl;
else
  cout << "x is not divisible by 2, 3 or 5." << endl;
```

Nesting Statements

- All statements can be used as part of if-else statements.
- Single if-else statement can also be nested another if or else if statement.

```
if (boolean_condition) {
   if (boolean_condition)
      do something
   else
       do something else
}
```

- Else if … else are also nested in the similar manner.