If Construct in C++

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Making Decisions

• Computers can make decisions, example
  – Display greeting Mr. or Ms. base on user’s gender
  – Display AM or PM base on time
  – Display advertising base on interest (google/facebook)
  – Check if user’s name and password matches
  – (and much more...)
  – So how do we get our programs to decide things?
If statement

• If something happened then we can make computer perform a task.

• Example:
  – If number is odd then print out that number is odd
  – If the age is 67 then print out the person can retire
  – If password doesn’t match ask the user again
If Statement Model

- Model:
  ```cpp
  if ( comparison_is_true )
  {
      //do something here
  }
  ```

Example:
```cpp
if ( number % 2 == 1 )
{
    cout << number << " is odd." << endl;
}
```
## Conditional Comparison

<table>
<thead>
<tr>
<th>What I want to compare</th>
<th>Code in C++</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is x equal to y?</td>
<td>x == y</td>
</tr>
<tr>
<td>Is x not equal to y?</td>
<td>x != y</td>
</tr>
<tr>
<td>Is x less than y?</td>
<td>x &lt; y</td>
</tr>
<tr>
<td>Is x less than or equal to y?</td>
<td>x &lt;= y</td>
</tr>
<tr>
<td>Is x greater than y?</td>
<td>x &gt; y</td>
</tr>
<tr>
<td>Is x greater than or equal to y?</td>
<td>x &gt;= y</td>
</tr>
</tbody>
</table>
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 brackets

• Example:
  – if ( number % 2 == 1 )
    • cout << number << " is odd." << endl;
If statement using a block of code

• Sometimes multiple instructions needs to be executed if a condition was true, in which case the { } inclosing block MUST be provided.
• My advice: 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_comparation_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 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;
  if ( number % 3 == 1 )
      cout << "remainder of 1" << endl;
  if ( number % 3 == 2 )
      cout << "remainder of 2" << endl;
  ```
- What would be the output if number was 5?
Chain of if / else if statements

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

```cpp
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:
  ```cpp
  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?