Section 3.2: Compound Statements and Connectives
(Objectives 1-2)

Connectives: "and" "or" "if...then" "if and only if"

Compound Statements: composed of simple statements and connectives.

ex. Today is Friday and I can sleep late tomorrow.

<table>
<thead>
<tr>
<th>Unary Connective</th>
<th>Statements of Symbolic Logic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negation</td>
<td>&quot;not&quot;</td>
</tr>
<tr>
<td>Conjunction</td>
<td>&quot;and&quot;</td>
</tr>
<tr>
<td>Disjunction</td>
<td>&quot;or&quot;</td>
</tr>
<tr>
<td>Conditional</td>
<td>&quot;if...then&quot;</td>
</tr>
<tr>
<td>Biconditional</td>
<td>&quot;if and only if&quot;</td>
</tr>
</tbody>
</table>
Translating Words to Symbols

Let p and q represent the simple statements:

p: Jon is at work.  q: Mary is at home.

Negation: Jon is not at work.  ~p
Conjunction: Jon is at work and Mary is at home.  p ∧ q
Disjunction: Jon is at work or Mary is at home.  p ∨ q
Conditional: If Jon is at work, then Mary is at home.  p → q
Biconditional: Jon is at work if and only if Mary is at home.  p ↔ q

Translating Symbols to Words

Let p and q represent the simple statements:

p: Jon is at work.  q: Mary is at home.

~p ∨ q  Jon is not at work or Mary is at home.
~( p ∧ q) It is not the case that both Jon is at work and Mary is at home.
~p ∧ ~q  Jon is not at work and Mary is not at home.
~p → q  ____________________________________________________________
p ↔ ~q  Jon is at work if and only if Mary is not at home.
Let $p$ and $q$ represent the simple statements:

$p$: Jon is at work.
$q$: Jon is at home.

$\neg p \land \neg q$

Alternate: 

Notes: The connective "and" can also be expressed as "but", "however", "although", or "nevertheless".

The connective "or" is the "inclusive or". ("and/or") ("one or the other, or both")

In a conditional, "then" can be replaced by a comma.
Symbolic Statements with Parentheses

Commas indicate where to put parentheses. Statements on the same side of the comma are grouped within parentheses.

Let $p$, $q$, and $r$ represent the simple statements:

- $p$: My gas tank is full.
- $q$: Classes are cancelled.
- $r$: I am leaving town.

Write in symbolic form: Classes are cancelled, and if my gas tank is full then I'm leaving town.

Write in words: $(p \land \neg q) \rightarrow \neg r$

If my gas tank is full and my classes are not cancelled, then I am not leaving town.
You may have to indicate simple statements before translating into symbolic form.

ex. I do not know what time it is, but I am going to bed.

Let p: __________________________________________

q: __________________________________________

<table>
<thead>
<tr>
<th>both...and</th>
<th>Either...or</th>
</tr>
</thead>
<tbody>
<tr>
<td>p</td>
<td>v</td>
</tr>
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</table>

Symbolic form: ________________

ex. Either Ann is a singer or Bill writes poetry, and it is not the case that both Ann is a singer and Bill writes poetry.

Let p: Ann is a singer.

q: Bill writes poetry

Symbolic form: \((p \lor q) \land \sim(p \land q)\)

See text ex. 1 - 3, 5 - 7.