Quiz #3

1) Draw a Venn Diagram to show that this argument is invalid:
   1. All dogs are mammals
   2. Some animals are mammals
      Therefore, some animals are dogs

2) Construct a truth table for the symbolic expression \( \sim p \rightarrow (q \lor r) \)

<table>
<thead>
<tr>
<th>P</th>
<th>Q</th>
<th>R</th>
<th>\sim p</th>
<th>q \lor r</th>
<th>\sim p \rightarrow (q \lor r)</th>
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</table>
"If my computer’s wifi isn’t working, then I can’t use the WebAssign website."

\[ p: \text{my computer’s wifi is working} \]
\[ q: \text{I can use WebAssign} \]
\[ \neg p \rightarrow \neg q \]

"If I can’t use the WebAssign website, then my computer’s wifi must not be working."

\[ \neg q \rightarrow \neg p \]

"If my computer’s wifi IS working, then I CAN use the WebAssign website."

\[ p \rightarrow q \]

"Inverse"

"If I can use the WebAssign website, then my computer’s wifi must be working."

\[ q \rightarrow p \]

"Converse"

"Contra-positive"
The "Biconditional"

A triangle has three equal angles if and only if it has three equal sides.

\( p = \) a triangle has three equal angles
\( q = \) a triangle has three equal sides

\( p \iff q \), which means: \((p \implies q) \land (q \implies p)\)

<table>
<thead>
<tr>
<th>p</th>
<th>q</th>
<th>( p \iff q )</th>
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</table>
Parentheses

\[ p = \text{I build planter boxes} \]
\[ q = \text{that gopher gets in my garden} \]
\[ r = \text{I will lose my lettuce} \]

\[(p \lor q) \Rightarrow r\]
\[p \lor (q \Rightarrow r)\]

\begin{align*}
\text{If I build planter boxes or that gopher gets in my garden, then} \\
\text{I will lose my lettuce.} \\
\text{planter boxes... bad!} \\
\end{align*}

\begin{align*}
\text{I build planter boxes, or} \\
\text{if that gopher gets in my garden then I will lose my lettuce.} \\
\text{planter boxes... good!} \\
\end{align*}

Parentheses are not needed with the negation symbol (~).

Parentheses are not needed when the sentence only uses one kind of symbol (\(\land\) or \(\lor\)).

Parentheses ARE needed any time there is more than one kind of symbol in the sentence!
Preview of 1.5: Establishing Validity of Arguments

1. Socrates is a man
2. All men are mortal

C. Socrates is mortal.

"Valid" means: If the premises are true, then the conclusion is true.

\[(1. \land 2.) \rightarrow C.\]

1. Socrates is a man \( \rightarrow \) If Socrates then man \( p \rightarrow q \)
2. All men are mortal \( \rightarrow \) If man then mortal \( q \rightarrow r \)

C. Socrates is mortal \( \rightarrow \) If Socrates then mortal \( p \rightarrow r \)

\[
\begin{align*}
\text{p: this object is Socrates} \\
\text{q: this object is a man} \\
\text{r: this object is mortal} \\
\end{align*}
\]

\[
(1. \land 2.) \rightarrow C.
((p \rightarrow q) \land (q \rightarrow r)) \rightarrow (p \rightarrow r)
\]