CRITICAL THINKING

Review Session #2

Modern Symbolic Logic

Professor David Emmanuel Gray

Reminder: Different Symbols

The logical symbols used by Vaughn (2010) are sometimes different from those used by Copi and Cohen (2009). I will stick to using the symbols from Vaughn, but here is a handy table for translating the various symbols they each use:

Logical Operator	Vaughn (2010)	Copi & Cohen (2009)
Conjunction	& (ampersand)	• (dot)
Negation	~ (tilde)	~ (tilde)
Disjunction	∨ (wedge)	∨ (wedge)
Implication	→ (arrow)	⊃ (horseshoe)
Equivalence	None/Not Used	≡ (triple-bar)
Therefore	∴ (triple-dot)	∴ (triple-dot)

The Skills You Have Practiced…

1. Translating English into the language of logic,
2. Assessing the validity of an argument with a truth table, and
3. Proving the validity of an argument with natural deduction.

Translating English to Logic: *Instructions*

Translating English to the language of symbolic logic works as follows:

1. Use capital letters to label each simple positive statement involved (sometimes these capital letters may be provided for you, sometimes they may not),
2. Perform statement classification (recall this from the first week of class),
3. Combine those capital letters with the logical operators to symbolize the results of statement classification, and
4. Be sure to use the grouping punctuation (parentheses and/or brackets) as needed.

Translating English to Logic: *Common Problems*

Remember the compound statement indicator words. But do not get complacent—you are not a robot!

Common Conjunctive Indicators

and	but	while
both … and …	yet	however
also	though	furthermore

Common Disjunctive Indicators

or	either … or …	unless

Common Hypothetical Indicators

if … then …	if [vs.] only if	necessary [vs.] sufficient

Translating English to Logic: *Common Problems*

There are still some tricky patterns to remember:

– "not both" vs. "both not",

– "sufficient" vs. "necessary",

– "if" vs. "only if", and

– commas distinguishing sub-statements with parentheses.

Translating English to Logic: *Example #1*

Getting straight A's is sufficient for making the Dean's list.

Translating English to Logic: *Example #2*

Getting an A in this class is necessary for getting straight A's.

Assessing Validity with a Truth Table: *Instructions*

Assessing the validity of an argument with a truth table is done according to the followings steps:

1. Put the argument into argumentative form,
2. Label each simple positive statement in the argument,
3. Translate the argument into the language of symbolic logic,
4. Construct a truth table representing the argument,
5. Circle any rows in which all the premises are true,
6. Circle the conclusion in these rows, and
7. Check validity. If the conclusion is true is *all* those rows, then it is a *valid* argument. If the conclusion is false in *at least one* of those rows, then the argument is *invalid*.

Assessing Validity with a Truth Table: *Common Problems*

People often get confused about setting up the rows of the truth table. Remember that there will be 2^n lines, where n is the number of simple positive statements involved. Then, do not forget how to fill in the initial T's and F's for these simple positive statements.

People sometimes get confused about which line(s) to look at for checking validity once the table is filled in.

Assessing Validity with a Truth Table: *Example #1*

If I study hard then I will pass this class. Furthermore, if I pass this class then I will make the Dean's list. Therefore, if I study hard then I will make the Dean's list.

Natural Deduction: *Instructions*

Proving the validity of an argument using natural deduction works as follows:

1. Translate the argument (if it is in English) into the language of symbolic logic,
2. Put the argument into argumentative form, and
3. Use the nine rules of inference to derive the conclusion from the premises.

Natural Deduction: *Common Problems*

There are a variety of distinct problems when doing natural deduction:

1. Forgetting or mixing up the nine rules of inference,
2. Not recognizing the simpler patterns when they appear,
3. Not keeping track of "what I need" and "what I can get",
4. Mixing up the numbers when stating a justification,
5. Forgetting the last line will be the argument's conclusion, and
6. Panicking and giving up when things get tough.

Natural Deduction: *Example #1*

1. $(E \vee F) \rightarrow (G \,\&\, H)$.
2. $(G \vee H) \rightarrow I$.
3. E.

$\therefore$ I.

Next Class…

We will have **unit exam #2**.

Keep practicing! You can do this!