Philosophy 57 — Day 26

- Quiz #7 on Tuesday (simple truth-tables, properties, relations)
- Extra-Credit Problems Posted on Website (5 problems, 1 point each)
  - Due by Tuesday 05/20/03
  - You can email them to me, or put them in my FOB mailbox (Phil. Dept.)
  - I will discuss these problems (especially #3–#5) briefly on Tuesday
- Approximate "curve up to this point" ($\frac{\text{average of 4 best quiz scores + mid-term score}}{2}$)
  - 88–100 (A); 80–87 (B); 70–79 (C); 60-69 (D); < 60 (F);
- Final Exam (more details on Tuesday)
  - Cumulative, but emphasis on second half of course (chs. 4–6)
  - Two 8.5×11 sheets (4 sides) of notes allowed
  - Section 3: Friday, May 16, 9:45am–12:00pm
  - Section 5: Monday, May 19, 2:45–5:00pm

Chapter 6 — Propositional Logic: Truth Tables IX

- Remember, an argument is valid if it is *impossible* for its premises to be true while its conclusion is false. Let $p_1, \ldots, p_n$ be the premises of a PL argument, and let q be the conclusion of the argument. Then, we have the following:

$$\begin{array}{l} p_1 \\ \vdots \\ p_n \\ \hline \therefore q \end{array}$$ is valid if and only if there is no row in the simultaneous truth-table of $p_1, \ldots, p_n$, and q which looks like the following:

atoms		premises				conclusion
$\cdots$		p_1	$\cdots$		p_n	q
$\cdots$		T	T		T	F

- We will use simultaneous truth-tables to prove validities and invalidities. For example, consider the following valid argument: A, $A \supset B$, therefore, B.

$$\begin{array}{l} A \\ A \supset B \\ \hline \therefore B \end{array}$$

atoms		premises				conclusion
A	B	A	A	$\supset$	B	B
T	T	T	T	T	T	T
T	F	T	T	F	F	F
F	T	F	F	T	T	T
F	F	F	F	T	F	F

☞ VALID — since there is no row in which A and $A \supset B$ are both T, but B is F.

- In general, we'll use the following procedure for evaluating arguments:
  1. Translate and symbolize the the argument (if given in English).
  2. Write out the symbolized argument (as above).
  3. Draw a simultaneous truth-table for the symbolized argument, outlining the columns representing the premises and conclusion.
  4. Look for a row of the table in which all of the premises are true and the conclusion is false. If there is one, the argument is invalid; if not, it's valid.
- Let's practice this procedure on some examples . . .

Chapter 6 — Propositional Logic: Truth Tables X

- Examples (from exercise set 6.4.I) — Use LogicCoach!
  2. Brazil has a huge foreign debt. Therefore, either Brazil or Argentina has a huge foreign debt.
  3. If fossil fuel combustion continues at its present rate, then a greenhouse effect occurs. If a greenhouse effect occurs, then world temperatures will rise. Therefore, if fossil fuel combustion continues at its present rate, then world temperatures will rise.
  7. Einstein won the Noble Prize either for explaining the photoelectric effect or for the special theory of relativity. But he did win the Noble Prize for explaining the photoelectric effect. Therefore, he did not win the Noble Prize for the special theory of relativity.
  9. Either the USS Arizona or the USS Missouri was not sunk in the attack on Pearl Harbor. Therefore, it is not the case that either the USS Arizona or the USS Missouri was sunk in the attack on Pearl Harbor.

Chapter 6 — Propositional Logic: Truth Tables XI

- The corresponding conditional of an argument has as its antecedent the conjunction of the premises, and as its consequent the conclusion.

Argument	Corresponding Conditional of Argument
A $A \supset B$ $\therefore B$	$(A \bullet (A \supset B)) \supset B$
$A \supset B$ $B \supset C$ $\therefore A \supset C$	$[(A \supset B) \bullet (B \supset C)] \supset (A \supset C)$
$A \vee B$ $\sim A$ $\therefore B$	$[(A \vee B) \bullet \sim A] \supset B$

- An argument is valid iff its corresponding conditional is logically true. *This* is why $\supset$ is defined as it is (no other truth-function would give us this property).

Chapter 6 — Propositional Logic: Truth Tables XII

- There is a "short-cut" or "indirect" method for doing simultaneous truth-tables of arguments in propositional logic. This method can save time in some cases.
- Instead of constructing the entire truth-table, you can simply try to construct a row of the table in which the premises are true and the conclusion is false.
- If you can construct such a row, then the argument is invalid. If constructing such a row is impossible, then the argument is valid.
- Example: consider the argument from B and $A \supset B$ to A. Let's try to construct a row in which B and $A \supset B$ are both true, but A is false.

A	B	B	A	$\supset$	B	A
F	T	T	F	T	T	F

- Since we succeeded in constructing such a row, the argument is invalid.
- But, what happens when we try this on a *valid* argument? The answer is that we *cannot* consistently construct such a row. Let's try this . . .

Chapter 6 — Propositional Logic: Truth Tables XIII

PL Argument Form	Name	Valid/Invalid
p $p \supset q$ $\therefore q$	Modus Ponens	Valid
p $q \supset p$ $\therefore q$	Affirming the Consequent	Invalid
$\sim q$ $p \supset q$ $\therefore \sim p$	Modus Tollens	Valid
$\sim p$ $p \supset q$ $\therefore \sim q$	Denying the Antecedent	Invalid
$p \supset q$ $q \supset r$ $\therefore p \supset r$	Hypothetical Syllogism	Valid
$\sim p$ $p \vee q$ $\therefore q$	Disjunctive Syllogism	Valid

Extra-Credit Problems (Tips)

- Part I: You are given two 4-atom PL arguments, and asked to determine if they are valid or invalid. If the argument is invalid, you only need to report the row that proves it. If it's valid, you need to do the whole table.
- Hint: try the "indirect" method first. If you succeed in finding a row in which all premises are true and conclusion is false, then you are done. If you can't seem to find such a row, then do the whole truth-table.
- If you want to play it safe, just do the whole truth-table for each problem, and then say whether the argument is valid or not.
- Part II: Knights, Knaves, and truth-tables. This one requires some discussion. I will go to the handout now to explain this set of puzzles.
- Example: You meet two inhabitants: Zoey and Mel. Zoey tells you that Mel is a knave. Mel says, "Neither Zoey nor I are knaves." So who is a knight and who is a knave? I will work this example in some detail.

Final Examination (Outline)

- On Tuesday, if time permits, I will take questions for Final Exam review. Please bring any questions you have with you on Tuesday.
- Outline of Final Exam (roughly):
  - Chapters 1–3 (1/6, ≈17%)
    - True/False, Multiple Choice, And/Or Matching
    - Roughly like quizzes
  - Chapters 4–5 (2/6, ≈33%)
    - Translation
    - Venn Diagrams for Claims and/or Arguments
  - Chapter 6 (3/6, ≈50%)
    - Translation
    - Truth Tables for Claims and/or Arguments
- Two 8.5×11 sheets (4 sides) of notes allowed for final.