Introduction to Logical Reasoning

Workshop on Translating Natural Language and Creating Truth Tables

Professor David Emmanuel Gray

Northwestern University in Qatar
Carnegie Mellon University in Qatar

Part I, Problem 1 Solution

The **computer** science students love logic. (C)

C.

Part I, Problem 2 Solution

Either the **journalism** or the **business** students love logic. (J, B)

$J \vee B.$

Part I, Problem 3 Solution

The business students do not **hate** logic, but they **love** it. (H, L)

~H & L.

Part I, Problem 4 Solution

If the **journalism** students do not love logic, then the logic **professor** is sad. (J, P)

$\sim J \rightarrow P.$

Part I, Problem 5 Solution

The **journalism** or the **business** students love logic, and the logic **professor** is happy. (J, B, P)

$(J \vee B) \,\&\, P.$

Part II, Problem 1 Solution

Journalism and **business** students do not both love logic. (J, B)

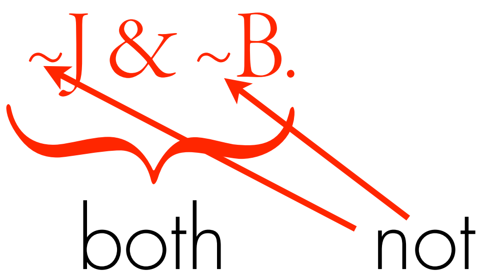
~(J & B).

not both

The "not" comes before the "both", which means that we have a negation ("not") applied to a conjunction ("both"). So the tilda comes outside the parentheses.

❧ Part II, Problem 2 Solution

Journalism and **business** students both do not love logic. (J, B)



The "both" comes before the "not", which means that we have a conjunction ("both") applied to two things that are *each* being negated ("not") *separately*.

Part II, Problem 3 Solution

It is not the case that either **business** students hate money or the **computer** science students hate numbers. (B, C)

$$\sim(B \vee C).$$

not either

The "either/or" treats puts the two disjuncts together (between parentheses). Since the negation comes before this disjunction, it negates the whole thing.

Part II, Problem 4 Solution

Either it is not the case that **business** students hate money or the **computer** science students hate numbers. (B, C)

Treat anything between "either" and "or" as the first disjunct. Anything after "or" is the second disjunct. So the negation only applies to the first disjunct.

Part II, Problem 5 Solution

If the logic **professor** teaches well then the **journalism** students do not commit fallacies and the **business** students reason clearly. (P, J, B)

$$P \rightarrow (\sim J \& B).$$

Everything following the "then" is part of the consequent of this main hypothetical statement. So the entire consequent, which is a conjunction ("and"), is put inside a set of parentheses.

Part II, Problem 6 Solution

If the logic **professor** teaches well then the **journalism** students do not commit fallacies, and the **business** students reason clearly. (P, J, B)

$$(P \rightarrow {\sim}J) \ \& \ B.$$

In this case, the use of the comma tells us when the hypothetical is finished, so we can put it inside a set of parentheses. What follows is a second conjunct ("and"), making the hypothetical the first conjunct.

Part III, Problem 1 Solution

p	q	$\sim q$	$p \vee \sim q$	$\sim(p \vee \sim q)$
T	T	F	T	F
T	F	T	T	F
F	T	F	F	T
F	F	T	T	F

This is a contingent statement because it can be true (as in line 3) and it can be false (as in lines 1, 2, and 4).

Part III, Problem 2 Solution

p	q	r	$\sim r$	$p \,\&\, q$	$r \vee \sim r$	$(p \,\&\, q) \rightarrow (r \vee \sim r)$
T	T	T	F	T	T	T
T	T	F	T	T	T	T
T	F	T	F	F	T	T
T	F	F	T	F	T	T
F	T	T	F	F	T	T
F	T	F	T	F	T	T
F	F	T	F	F	T	T
F	F	F	T	F	T	T

This is a tautology because it is always true.

Part III, Problem 3 Solution

p	q	$\sim q$	$\sim p$	$p \,\&\, \sim q$	$(p \,\&\, \sim q) \rightarrow \sim p$
T	T	F	F	F	T
T	F	T	F	T	F
F	T	F	T	F	T
F	F	T	T	F	T

This is a contingent statement because it can be true (as in lines 1, 3, and 4) and it can be false (as in line 2).

Next Class…

You will learn how to use truth tables to assess the deductive validity of an argument.

Also, please don't forget to turn in your response to the Workshop #5 Questionnaire on your way out.