Introduction to Logical Reasoning

Workshop #5: Translating Natural Language & Creating Truth Tables (Solutions)

Part I: Each of the following problems presents a statement in English. Translate each of them into the language of symbolic logic, using the indicated capital letters to label each simple positive statement involved. These problems should be fairly straightforward.

1. The **computer** scientists love logic. (C)

C.

Simple positive statements ordered correctly [1]. No other mistakes [1].

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

$J \vee B$.

Simple positive statements ordered correctly [2]. Correct connective [1]. No other mistakes [1].

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

$\sim H \ \& \ L$.

Simple positive statements ordered correctly [2]. Correct connectives [2]. No other mistakes [1].

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

$\sim J \rightarrow P$.

Simple positive statements ordered correctly [2]. Correct connectives [2]. No other mistakes [1].

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

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

Simple positive statements ordered correctly [3]. Correct connectives [2] and parentheses grouping [1]. No other mistakes [1].

Part II: Each of the following problems presents a statement in English. Translate each of them into the language of symbolic logic, using the indicated capital letters to label each simple positive statement involved. Some of these problems may require more thought, but they exhibit some commonly-used patterns.

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

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

Simple positive statements ordered correctly [2]. Correct connectives [2] and parentheses grouping [1]. No other mistakes [1].

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

$\sim J \ \& \sim B$.

Simple positive statements ordered correctly [2]. Correct connectives [3]. No other mistakes [1].

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

$\sim(J \vee B)$.

Simple positive statements ordered correctly [2]. Correct connectives [2] and parentheses grouping [1]. No other mistakes [1].

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

$\sim J \vee B$.

Simple positive statements ordered correctly [2]. Correct connectives [2]. No other mistakes [1].

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

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

Simple positive statements ordered correctly [3]. Correct connectives [3] and parentheses grouping [1]. No other mistakes [1].

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

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

Simple positive statements ordered correctly [3]. Correct connectives [3] and parentheses grouping [1]. No other mistakes [1].

Please continue ▶

Workshop #5: Translating Natural Language & Creating Truth Tables (Solutions)

Part III: Each of the following problems presents a statement in logical form. Construct a truth table for each, and use that table to briefly explain whether it is a tautology, a contradiction, or a contingent statement.

1. $\sim(p \vee \sim q)$.

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 [2] because it can be **true** (as in line 3) and it can be **false** (as in lines 1, 2, and 4) [3].

Table filled in correctly [12]. Following directions [1]. No other mistakes [1].

2. $(p \,\&\, q) \rightarrow (r \vee \sim r)$.

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* [2] because it is always **true** [3].

Table filled in correctly [32]. Following directions [1]. No other mistakes [1].

3. $(p \,\&\, \sim q) \rightarrow \sim p$.

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 [2] because it can be **true** (as in lines 1, 3, and 4) and it can be **false** (as in line 2) [3].

Correctly set up top row [6] and initial columns [4]. Remaining table filled in correctly [16]. Following directions [1]. No other mistakes [1].