Homework 2
PHL 109

Name:_____ Date:_____

1 Translations

Symbolize the folowing sentences of English saying what atomic sentences your letters stand for. Write these sentences so they are grammatically complete, and also explicit (replace words like 'they' and 'it' with the phrases which they stand for in the context). Be sure that your simple sentences do not contain any connective-words, and that you do not use two sentence-letters for what is essentially the same English sentence. Use the suggested sentence-letters where given, and use no connectives other than $\neg$, $\wedge$, $\rightarrow$, $\longleftrightarrow$ *and* $\vee$.

1 Either my father is wise or he is honest, but he is not both. (Use 'W' and 'H')

2 Van Gogh's pictures are neither the world's most valuable nor the most profound. (Use 'E' and 'P')

3 Van Gogh's pictures are not the world's most valuable, but they are the most profound. (Use 'E' and 'P')

4 Neither digital computers nor neural networks will be able to simulate human intelligence, unless humans make significant advances in computer science. (Use 'D', 'N', 'C')

5 It's not the case that if humans make advances in robotics, they will necessarily be able to simulate human intelligence. (Use two sentence letters)

6 If humans do not make advances in robotics, they definitely will not be able to simulate human intelligence. (Use the same two sentence letters from the previous problem)

7 Either September does not have 31 days, or if July has 31 days, then so does August. (3 sentence letters)

2 Truth Tables: Evaluating Sentences

Construct a complete truth table for each of the sentences below. Circle the column of the table containing the main connective. Then, use the truth table to determine whether each sentence is logically truth, logically false, or contingent.

8 $((E \to F) \to F) \to E$

9 $((Z \to X) \wedge (X \vee Z)) \to X$

10 $((Z \wedge X) \wedge (Z \to \neg X)$

3 Truth Tables: Relations Between Sentences

Construct a complete truth table for each of the sentences below. Circle the column of the table containing the main connective. Then, use the truth table to determine whether the two sentences are equivalent, contradictory, consistent, or inconsistent.

11 Sentence 1: $R \vee \neg S$; Sentence 2: $S \wedge \neg R$

12 Sentence 1: $P \to Q$; Sentence 2: $((P \vee Q) \longleftrightarrow Q)$

13 Sentence 1: $(P \vee \neg S) \longleftrightarrow P$; Sentence 2: $(P \vee \neg S) \longleftrightarrow S$

4 Truth Tables: Validity Testing

Construct a complete simultaneous (i.e. joint) truth table for each of the arguments below (one truth table per numbered question). Then determine whether the argument is valid. ***If the argument is invalid, point out which row(s) invalidate it.***

14 P1: $\neg(W \wedge \neg X)$

P2: $\neg(X \wedge \neg W)$

C: $X \vee W$

15 P1: $A \to (N \vee Q)$

P2: $\neg(N \vee \neg A)$

C: $A \to Q$