Some Full Truth-Tables from Lecture

Philosophy 12A
February 16, 2008

1 Truth-Tables for Individual Statements (Logical Truth, *etc.*)

Here are solutions to some of the problems from lecture about logical truth, logical falsity, and contingency of individual LSL sentences. In the truth-tables, the blue columns are the main connectives, and the others are quasi-columns. I have numbered the columns in the order in which I have done the computations (actually, my computer program made these!).

3. '$(S \to R) \,\&\, (S \,\&\, \sim R)$' is *logically false* (*self-contradictory*):

R	S	(S→R)	&	(S & ~R)	
⊤	⊤	⊤	⊥	⊥	⊥
⊤	⊥	⊤	⊥	⊥	⊥
⊥	⊤	⊥	⊥	⊤	⊤
⊥	⊥	⊤	⊥	⊥	⊤
		2	4	3	1

4. '$((E \to F) \to F) \to E$' is *contingent*:

E	F	((E→F)	→F)	→E
⊤	⊤	⊤	⊤	⊤
⊤	⊥	⊥	⊤	⊤
⊥	⊤	⊤	⊤	⊥
⊥	⊥	⊤	⊥	⊤
		1	2	3

12. '$[(H \to N) \,\&\, (T \to N)] \to [(H \vee T) \to N]$' is *logically true* (*tautologous*):

H	N	T	((H→N)	&	(T→N))	→	((H∨T)	→N)
⊤	⊤	⊤	⊤	⊤	⊤	⊤	⊤	⊤
⊤	⊤	⊥	⊤	⊤	⊤	⊤	⊤	⊤
⊤	⊥	⊤	⊥	⊥	⊥	⊤	⊤	⊥
⊤	⊥	⊥	⊥	⊥	⊤	⊤	⊤	⊥
⊥	⊤	⊤	⊤	⊤	⊤	⊤	⊤	⊤
⊥	⊤	⊥	⊤	⊤	⊤	⊤	⊥	⊤
⊥	⊥	⊤	⊤	⊥	⊥	⊤	⊤	⊥
⊥	⊥	⊥	⊤	⊤	⊤	⊤	⊥	⊤
			3	5	2	6	1	4

15. '$[(F \vee E) \,\&\, (G \vee H)] \leftrightarrow [(G \,\&\, E) \vee (F \,\&\, H)]$' is *contingent*:

E	F	G	H	((F∨E)	&	(G∨H))	↔	((G & E)	∨	(F & H))
⊤	⊤	⊤	⊤	⊤	⊤	⊤	⊤	⊤	⊤	⊤
⊤	⊤	⊤	⊥	⊤	⊤	⊤	⊤	⊤	⊤	⊥
⊤	⊤	⊥	⊤	⊤	⊤	⊤	⊤	⊥	⊤	⊤
⊤	⊤	⊥	⊥	⊤	⊥	⊥	⊤	⊥	⊥	⊥
⊤	⊥	⊤	⊤	⊤	⊤	⊤	⊤	⊤	⊤	⊥
⊤	⊥	⊤	⊥	⊤	⊤	⊤	⊤	⊥	⊤	⊥
⊤	⊥	⊥	⊤	⊤	⊤	⊤	⊥	⊥	⊥	⊥
⊤	⊥	⊥	⊥	⊤	⊥	⊥	⊤	⊥	⊥	⊥
⊥	⊤	⊤	⊤	⊤	⊤	⊤	⊤	⊥	⊤	⊤
⊥	⊤	⊤	⊥	⊤	⊤	⊤	⊥	⊥	⊥	⊥
⊥	⊤	⊥	⊤	⊤	⊤	⊤	⊤	⊥	⊤	⊤
⊥	⊤	⊥	⊥	⊤	⊥	⊥	⊤	⊥	⊥	⊥
⊥	⊥	⊤	⊤	⊥	⊥	⊤	⊤	⊥	⊥	⊥
⊥	⊥	⊤	⊥	⊥	⊥	⊤	⊤	⊥	⊥	⊥
⊥	⊥	⊥	⊤	⊥	⊥	⊤	⊤	⊥	⊥	⊥
⊥	⊥	⊥	⊥	⊥	⊥	⊥	⊤	⊥	⊥	⊥
				4	6	3	7	2	5	1

2 Truth-Tables for Pairs of Statements (Equivalence, *etc.*)

3. '$H \leftrightarrow {\sim}G$' and '$(G \,\&\, H) \vee ({\sim}G \,\&\, {\sim}H)$' are *contradictory*:

G	H	H	↔	~	G	(G	&	H)	∨	(	~	G	&	~	H)
⊤	⊤	⊥		⊥		⊤		⊤		⊥		⊥		⊥	
⊤	⊥	⊤		⊥		⊥		⊥		⊥		⊥		⊤	
⊥	⊤	⊤		⊤		⊥		⊥		⊤		⊥		⊥	
⊥	⊥	⊥		⊤		⊥		⊤		⊤		⊤		⊤	
		2		1		3		5		2		4		1	

4. '$N \,\&\, (A \vee {\sim}E)$' and '$({\sim}A \,\&\, (E \vee {\sim}N)$' are *inconsistent* (but *not* contradictory):

A	E	N	N	&	(	A	∨	~	E)	~	A	&	(	E	∨	~	N)
⊤	⊤	⊤	⊤			⊤		⊥		⊥		⊥		⊤		⊥	
⊤	⊤	⊥	⊥			⊤		⊥		⊥		⊥		⊤		⊤	
⊤	⊥	⊤	⊤			⊤		⊤		⊥		⊥		⊥		⊥	
⊤	⊥	⊥	⊥			⊤		⊤		⊥		⊥		⊤		⊤	
⊥	⊤	⊤	⊥			⊥		⊥		⊤		⊤		⊤		⊥	
⊥	⊤	⊥	⊥			⊥		⊥		⊤		⊤		⊤		⊤	
⊥	⊥	⊤	⊤			⊤		⊤		⊤		⊥		⊥		⊥	
⊥	⊥	⊥	⊥			⊤		⊤		⊤		⊤		⊤		⊤	
			3			2		1		2		4		3		1	

6. '$R \,\&\, (Q \vee S)$' and '$(S \vee R) \,\&\, (Q \vee R)$' are *consistent* (but *not* equivalent):

Q	R	S	R	&	(	Q	∨	S)	(S	∨	R)	&	(Q	∨	R)
⊤	⊤	⊤	⊤			⊤			⊤		⊤		⊤		
⊤	⊤	⊥	⊤			⊤			⊤		⊤		⊤		
⊤	⊥	⊤	⊥			⊤			⊤		⊤		⊤		
⊤	⊥	⊥	⊥			⊤			⊥		⊥		⊤		
⊥	⊤	⊤	⊤			⊤			⊤		⊤		⊤		
⊥	⊤	⊥	⊥			⊥			⊤		⊤		⊤		
⊥	⊥	⊤	⊥			⊤			⊤		⊥		⊥		
⊥	⊥	⊥	⊥			⊥			⊥		⊥		⊥		
			2			1			2		3		1		

8. '$Q \rightarrow {\sim}(K \vee F)$' and '$(K \,\&\, Q) \vee (F \,\&\, Q)$' are *contradictory*:

F	K	Q	Q	→	~	(	K	∨	F)	(K	&	Q)	∨	(F	&	Q)
⊤	⊤	⊤	⊥		⊥		⊤			⊤		⊤		⊤		
⊤	⊤	⊥	⊤		⊥		⊤			⊥		⊥		⊥		
⊤	⊥	⊤	⊥		⊥		⊤			⊥		⊤		⊤		
⊤	⊥	⊥	⊤		⊥		⊤			⊥		⊥		⊥		
⊥	⊤	⊤	⊥		⊥		⊤			⊤		⊤		⊥		
⊥	⊤	⊥	⊤		⊥		⊤			⊥		⊥		⊥		
⊥	⊥	⊤	⊤		⊤		⊥			⊥		⊥		⊥		
⊥	⊥	⊥	⊤		⊤		⊥			⊥		⊥		⊥		
			3		2		1			2		3		1		