

Name _____

EXTRA CREDIT – TRUTH TABLES!

The logical operator utilized in our previous lesson objectives to form a truth table is the **logical implication** operator, in which a false value is produced when the *hypothesis* is true and the *conclusion* is false. The symbol used in these tables is denoted as $\rightarrow$.

Another logical operator we can use to create a truth table is called **logical conjunction**, in which a true value is produced when the *hypothesis* and *conclusion* are TRUE. The symbol used in these tables is denoted as $\wedge$.

Example: Construct a truth table using logical conjunction.

p	q	$p \wedge q$
T	T	T
T	F	F
F	T	F
F	F	F

In **logical disjunction**, a true value is produced if the *hypothesis* or the *conclusion* is TRUE. The symbol used in these tables is denoted as $\vee$.

Example: Construct a truth table using logical disjunction.

p	q	$p \vee q$
T	T	T
T	F	T
F	T	T
F	F	F

Complete the following truth tables using the operators above.

1.

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

2.

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

3.

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

4.

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

5.

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

6.

p	q	$\sim p$	$\sim q$	$\sim p \wedge \sim q$
T	T			
T	F			
F	T			
F	F			

7.

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

8.

p	q	r	$p \vee q$	$(p \vee q) \wedge r$
T	T	T		
T	T	F		
T	F	T		
T	F	F		
F	T	T		
F	T	F		
F	F	T		
F	F	F		

9.

p	q	r	$p \wedge r$	$q \wedge r$	$(p \wedge r) \vee (q \wedge r)$
T	T	T			
T	T	F			
T	F	T			
T	F	F			
F	T	T			
F	T	F			
F	F	T			
F	F	F			

10. Using the truth tables above, which statements are logically equivalent? (*hint: there should be three pairs!*)

1. _____ and _____

2. _____ and _____

3. _____ and _____