Tutorial 1

1. Given the value of $P \longrightarrow Q$ is false, determine the value of $(\sim P \vee \sim Q) \longrightarrow Q$.

2. There are two restaurants next to each other. One has the signboard that says, "Good food is not cheap" and other has the signboard that says, "Cheap food is not good". Comment on: Are the signboards saying the same thing?

3. Let P = *He is intelligent* and Q = *He is tall* be two propositions. Write each of the following statements in the symbolic form using P and Q.

(a) He is tall but not intelligent.
(b) He is neither tall nor intelligent.
(c) He is intelligent or he is tall.
(d) It is not true that he is intelligent or tall.
(e) It is not true that he is not tall or not intelligent.

4. If there are 4 propositions (A, B, C, D), how many possible combinations of T/F values are there? Assume that A and B both T and C and D both F is a different combination than A and B both F, C and D both T.

5. Suppose the requirements for earning a bachelor's degree are:

(a) Passing a set of 12 courses in the major.
(b) Passing a set of 10 courses in general education.
(c) Completing at least 122 semester credits.
(d) (i) Passing a proficiency exam in a foreign language
or
(ii) Successfully completing two courses in a foreign language.
(e) Having at least a 2.0 GPA overall.
(f) Having at least a 2.25 GPA in your major.

(I) Write a symbolic expression using logical operators to represent these requirements.

(II) Suppose you have completed all the required courses in both the major and in general education. Suppose you also have 123 semester credits, an overall GPA of 2.2, and a GPA in the major of 2.15. Since you had four years of high school Spanish, you passed the foreign language proficiency exam. Will you get the degree?

6. Each statement is either true or false. Identify which case is correct, and then give some justification for your answer.

(a) The statements $\neg(P \vee Q)$ and $(\neg P) \vee (\neg Q)$ have the same truth values for all possible values of *P* and *Q*.
(b) The compound proposition $P \vee Q \vee R$ can be interpreted as either $P \vee (Q \vee R)$ or as $(P \vee Q) \vee R$

7. Determine which of the following statements are tautologies:

(a) $P \longrightarrow [(\neg P) \longrightarrow Q]$
(b) $(P \wedge Q) \vee Q$

8. Let P be the proposition "a man has discovered something he will die for" and let Q be the proposition "he is fit to live". Consider the implication $(\neg P) \longrightarrow (\neg Q)$: " If a man hasn't discovered something he will die for, then he isn't fit to live".

(a) Write the three derived implications (both symbolically and in English).
(b) Assume that the original implication is true. Briefly discuss what we know about the truth of the derived implications.

9. Determine whether the following pairs represent logically equivalent statements:

(a) $(P \wedge Q)$ and $\neg P \vee \neg Q$

(b) $(P \longrightarrow Q) \vee P$ and $(P \vee \neg Q) \wedge Q$

10. Construct a word problem and prove with the help of truth table that it is a contradiction.

11. Find a compound proposition involving the propositional variables p, q, r, and s that is true when exactly three of these propositional variables are true and is false otherwise.

12. Construct truth tables for the following:

a) $[(p \vee q) \wedge (\neg r)] \leftrightarrow q$

b) If p and q are false propositions, find the truth value of $(p \vee q) \wedge (\neg p \vee \neg q)$