**COL 202** Aug 1,2, 4

# TUTORIAL SHEET 1

1. Determine whether $(\neg q \wedge (p \rightarrow q)) \rightarrow \neg p$ is a tautology.

2. For each of the statements below, write them in the "if $p$, then $q$" form:

   - It is necessary to wash the boss's car to get promoted.
   - Wily gets caught whenever he cheats.
   - A sufficient condition for the warranty to be good is that you bought the computer less than a year ago.
   - It rains whenever the wind blows from the north.
   - It is necessary to walk 8 km per day to stay healthy.

3. The $n$th statement in a list of 100 statements is "Exactly $n$ of the statements in this list are false."

   - What conclusions can you draw from these statements ?
   - Answer part (a) if the $n$th statement is "At least $n$ of the statements in this list are false."
   - Answer part (b) assuming that the list contains 99 statements.

4. For each of the following statements, explain which rules of inference are used:

   - It is not raining or Yvette has her umbrella. Yvette does not have her umbrella or she does not get wet. It is raining or Yvette does not get wet. Therefore, Yvette does not get wet.
   - If it does not rain or if it is not foggy, then the sailing race will be held and the lifesaving demonstration will go on. If the sailing race is held, then the trophy will be awarded. The trophy is not awarded. Therefore, it rained.

5. Determine whether this argument is valid: If Superman were able and willing to prevent evil, he would do so. If Superman were unable to prevent evil, he would be impotent. If he were unwilling to prevent evil, he would be malevolent. Superman does not prevent evil. If Superman exists, he is neither impotent nor malevolent. Therefore, Superman does not exist.

6. Teachers in the Middle Ages supposedly tested the realtime propositional logic ability of a student via a technique known as an obligato game. In an obligato game, a number of rounds is set and in each round the teacher gives the student successive assertions that the student must either accept or reject as they are given. When the

student accepts an assertion, it is added as a commitment; when the student rejects an assertion its negation is added as a commitment. The student passes the test if the consistency of all commitments is maintained throughout the test.

- Suppose that in a three-round obligato game, the teacher first gives the student the proposition $p \to q$, then the proposition $\neg(p \vee r) \vee q$, and finally the proposition $q$. For which of the eight possible sequences of three answers will the student pass the test?
- Suppose that in a four-round obligato game, the teacher first gives the student the proposition $\neg(p \to (q \wedge r))$, then the proposition $p \vee \neg q$, then the proposition $\neg r$, and finally, the proposition $(p \wedge r) \vee (q \to p)$. For which of the 16 possible sequences of four answers will the student pass the test?
- Explain why every obligato game has a winning strategy.