Math 3336
Applications of Propositional Logic

Translating English Sentences

Steps to convert an English sentence to a statement in propositional logic:
1. Identify simple propositions and represent using propositional variables.
2. Determine appropriate logical connectives.

Examples: Translate the given statement into propositional logic using the propositions provided.

1. You cannot edit a protected Wikipedia entry unless you are an administrator.
   
   \( e \): You can edit a protected Wikipedia entry.
   \( a \): You are an administrator.

   Recall: \( q \) unless \( \neg p \) is a different way to express conditional \( p \to q \).

   Recall: contrapositive \( \neg q \to \neg p \) is logically equivalent to conditional \( p \to q \).

2. (only if)
   The match is burning only if there is oxygen in the room.

   \( b \): The match is burning.
   \( o \): There is oxygen in the room.
3. You can access the Internet from campus only if you are a computer science major or you are not a freshman.
   a = You can access the Internet from campus.
   c = You are a computer science major.
   f = You are a freshman.

Logic Puzzles

Example: An island has two kinds of inhabitants, knights, who always tell the truth, and knaves, who always lie.
You go to the island and meet A and B.
• A says “B is a knight.”
• B says “The two of us are of opposite types.”
What are the types are A and B?

• A says “We are both knaves.”
• B says nothing.
Example: When three professors are seated in a restaurant, the hostess asks them: “Does everyone want coffee?”
The first professor says: “I do not know.”
The second professor says: “I do not know.”
Finally, the third professor says: “No, not everyone wants coffee.”
The hostess comes back and gives coffee to the professors who want it. How did she figure out who wants coffee?