9.1 Intro to Logic

We have two main goals in this chapter:

1) Break down compound statements into simple statements.

2) Decide whether a compound statement is true or false.

These skills are important when reading legal documents such as employment contracts or tenancy agreements.

Definition: A simple statement is a sentence that is either true or false.

Example: Here are some simple statements. State the truth value for each one.

a) Water freezes at 23°C.

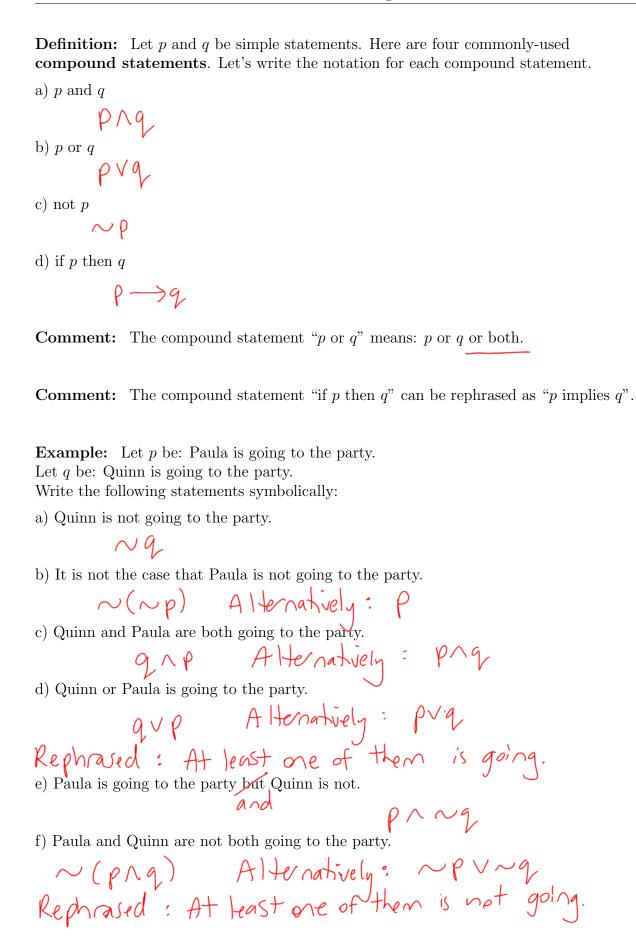
b) -2 is less than 3.

Example: The following are **not** simple statements:

a) Tomatoes are delicious.

b)
$$2x + 1 \ge 7$$
depends on $3x = 2$
c) Is it raining?

Question
d) Be quiet!



and

g) Neither Paula nor Quinn is going to the party.

NPANG Alternatively: ~ (pvg)

h) Paula or Quinn is going to the party but not both.

 $(\rho \vee q) \wedge \sim (\rho \wedge q)$

i) If Paula is going to the party then Quinn is going.

j) If Quinn is going to the party then Paula is not going.

Definition: Two compound statements are **logically equivalent** if they have the same meaning.

Fact: Recall De Morgan's Laws from Section 3.2:

$$(S \cup T)' = S' \cap T'$$

$$(S \cap T)' = S' \cup T'$$

Here is the logic version of De Morgan's Laws:

$$\sim (p \vee q)$$
 is logically equivalent to $\sim p \wedge \sim q$

$$\sim (p \land q)$$
 is logically equivalent to $\sim p \lor \sim q$

Fact: Order of Operations

In a compound statement we apply \sim first, then \wedge , then \vee , then \rightarrow , unless brackets indicate otherwise.

Example: Bracket the expressions below:

a) $\sim p \wedge q$

b) $p \lor q \land r$

(~p) ng,
pv (qnr)

c) $q \lor \sim p \to r$

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