9.3 If-Then Statements; If and Only If Statements

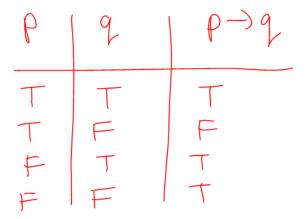
Recall that the statement "if p then q" is written: $p \to q$. We can think of $p \to q$ as a promise.

Example: Consider the statement "If the client likes you then you get a promotion." Let's fill in the table below.

Client Likes You	You Get a Promotion	Promise is Kept
T	T	T
T	F	E e promise is broken
F	T	T
F	F	T

Fact: The statement $p \to q$ is false exactly when p is true and q is false.

Example: Build the truth table for $p \to q$.



Example: Build the truth table for $r \to (p \land q)$.

Notation: The statement "p if and only if q" is written: $p \leftrightarrow q$.

Fact: The statement "p if and only if q" is true exactly when p and q have the same truth values.

Example: Build the truth table for $p \leftrightarrow q$.

Example: Build the truth table for $(p \lor q) \leftrightarrow r$.					
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Fact: Order of Operations

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

Example: Bracket the statements below:

a)
$$q \wedge r \to p$$

$$(q \wedge r) \to \rho$$
b) $\sim q \to r$

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

$$\rho \longleftrightarrow (q \lor r)$$

Comment: There is no consensus on where \oplus (exclusive or) fits into the order of operations, so statements involving \oplus should always be bracketed.