

9.3 If/Then; If and Only If

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$p \rightarrow q$: If p , then q

Think of $p \rightarrow q$ as a promise

Quick Ex : "If the client likes you,
then you get a promotion"

Client Likes You	Get a Promotion	Promise Kept?
Y	Y	Y
Y	N	(N) ←
N	Y	Y
N	N	Y

broken promise

p	q	$p \rightarrow q$
T	T	T
T	F	F
F	T	T
F	F	T

$p \rightarrow q$ is F when
 p is T and q is F

Ex: Build a truth table for $r \rightarrow (p \wedge q)$

3 statements : p, q, r

$2 \times 2 \times 2 = 8$ rows

p	q	r	$p \wedge q$	$r \rightarrow (p \wedge q)$
T	T	T	T	T
T	T	F	T	T
T	F	T	F	F
T	F	F	F	T
F	T	T	F	F
F	T	F	F	T
F	F	T	F	F
F	F	F	F	T

$p \leftrightarrow q$: p if and only if q

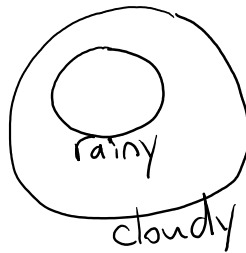
$p \leftrightarrow q$ is T when p and q have the same truth values

p	q	$p \leftrightarrow q$
T	T	T
T	F	F
F	T	F
F	F	T

Ex: Build the truth table for $(p \vee q) \leftrightarrow r$
3 statements

p	q	r	$p \vee q$	$(p \vee q) \leftrightarrow r$
T	T	T	T	T
T	T	F	T	F
T	F	T	T	T
T	F	F	T	F
F	T	T	T	T
F	T	F	T	F
F	F	T	F	F
F	F	F	F	T

Quick Ex:



If rainy then cloudy

Cloudy if rainy

Rainy implies cloudy

Rainy is sufficient for cloudy

Cloudy is necessary for rainy

Rainy only if cloudy

6 Equivalent Statements

if p then q

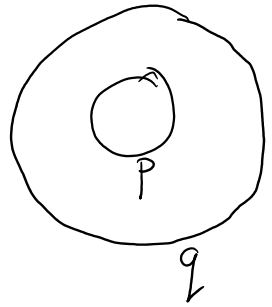
q if p

p implies q

p is sufficient for q

q is necessary for p

p only if q



Def

Given $p \rightarrow q$,

p is called the hypothesis

q

"

Conclusion

