

Lecture 2:-

Conjunction.. and, \wedge

Example:- today is Friday
it is raining.

P	Q	$P \wedge Q$
T	T	T
T	F	F
F	T	F
F	F	F

Let p = today is Friday
 q = it is raining.

\rightarrow R F R

$P \wedge Q$ = today is Friday and it is raining.

$$3+3=8$$

$$4+2=9$$

Let p = $(3+3=8)$ = F

q = $(4+2=9)$ = F

$P \wedge Q$ = $3+8=8 \wedge 4+2=9$.
R F F

Disjunction:-

V

"OR"

"Either"

P	Q	$P \vee Q$
T	T	T
T	F	T
F	T	T
F	F	F

Example:- today is Friday
it is raining.

Let p = today is Friday
 q = it is raining.

$P \vee Q$ = today is Friday or it is raining.
=.

Big Mistake:

Example:- today is not Friday
it is raining.

Let p = today is Friday
 q = it is raining.

$\neg P$ = today is not Friday.

$\neg P \wedge Q$ = today is not Friday and

it is raining.

Implication: \rightarrow

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\rightarrow if P then q.

\rightarrow q when P.

\rightarrow if P, q

\rightarrow q whenever P.

$P \rightarrow q$.

(P is Sufficient for q)X.

If I win election then I will lower taxes.

P	q	$P \rightarrow q$
T	T	T
T	F	F
F	T	T
F	F	T

Biconditional.

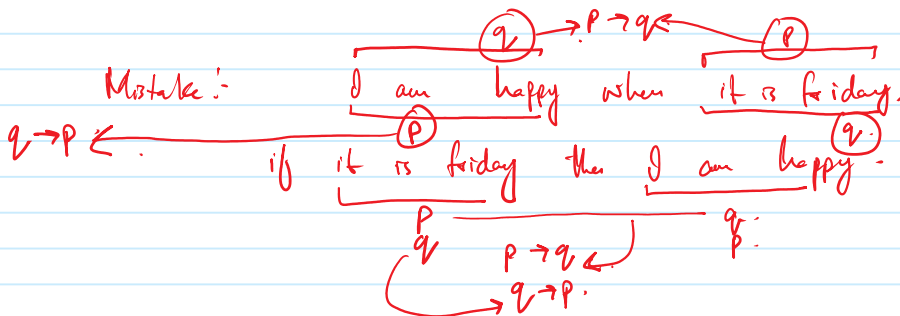
\leftrightarrow
 \rightarrow P is necessary & Sufficient for q.

\rightarrow if P then q & Conversely.

\rightarrow P iff q.

P	q	$P \leftrightarrow q$
T	T	T
T	F	F
F	T	F
F	F	T

I will take the flight iff I buy the ticket.



checking if two propositional Expressions are equal.

$(P \vee \neg q) \rightarrow (P \wedge q)$

P	q	$\neg q$	$P \vee \neg q$	$P \wedge q$	$(P \vee \neg q) \rightarrow (P \wedge q)$
T	T	F	T	T	T
T	F	T	T	F	F
F	T	F	F	F	T
F	F	T	T	F	F

Precedence:-

BODMAS.

Precedence:-

BODMAS.

- 1- \neg
- 2- \wedge
- 3- \vee
- 4- \rightarrow
- 5- \leftrightarrow

Ex. 12:-

Q11 (You can access the Internet) \rightarrow only if
(You are a CS major) \vee (You are not a freshman)

Solution:- Let p = You can access the Internet.
 q = You are CS major.
 r = You are a freshman.

$$p \rightarrow (q \vee \neg r)$$

Implication:-

$$p \rightarrow q.$$

Converse:-

$$q \rightarrow p$$

Inverse:-

$$\neg p \rightarrow \neg q$$

Contrapositive:-

$$\neg q \rightarrow \neg p.$$

If $\underbrace{\text{it is raining}}_p$ then $\underbrace{\text{we will win the match.}}_q$.

$q \rightarrow p$ = If we win the match then it is raining.

$\neg p \rightarrow \neg q$ = If it is not raining then we will not win the match.

$$\neg q \rightarrow \neg p$$

Question:-

$$\neg Y \rightarrow S.$$

Contrapositive.

$$\neg(\neg S) \Rightarrow \neg \neg Y = S \rightarrow \neg Y$$

Inverse

$$Y \rightarrow \neg S$$

Converse

$$\neg S \rightarrow \neg(\neg Y) = \neg S \rightarrow Y$$

Implication.

Ex 15/12.

1- System Consistency:-

P: 1, \

"(the diagnostic message is stored in buffer)
or it is retransmitted."
 \vee \wedge

$\neg P$ "the diagnostic message is not stored in buffer"

"If (the diagnostic message is stored in buffer) then
it is retransmitted."
 \rightarrow q

- ① $P \vee q = T$
- ② $\neg P = T$
- ③ $P \rightarrow q = T$

P	q	$P \vee q$
T	T	T
T	F	T
F	T	T
F	F	F

P	$\neg P$
T	F
F	T

H.W.

$$P \rightarrow q = T$$

Find truth
 value of $P \vee q$.

- ① $P \vee q = T$ ✓
- ② $\neg P = T$ ✓
- ③ $P \rightarrow q = T$

P	q	$P \vee q$
T	T	T
T	F	T
F	T	T
F	F	F

from ② $P = F \rightarrow$ ④

from ④ & ① $q = T \rightarrow$ ⑤

from ⑤ & ③ $F \rightarrow T = T$ holds.

Ex 16:- Add "the diagnostic message is
 not retransmitted".

- ① $P \vee q = T$
- ② $\neg P = T$
- ③ $P \rightarrow q = T$
- ④ $\neg q = T$

from ② $P = F$

from ④ $q = F$

from ②, ④ put in ①

$$F \vee F \neq T$$

Hence the system is
 inconsistent.