Compound statements

- Negation of a logical statement is another statement
- Connectivities are used to build compound statements from elementary or component statement

E.g "$\Rightarrow$" "and" "or" "if and only if"

-For Each choice

Compound sta

SPECIFICAT

logical connectivities	Notat
Negation	$\neg$
Conjunction	$P \wedge$
Disjunction	$P \vee$
Biconditional	$P \Leftarrow$
Conditional	$P \Rightarrow$

- For each choice of truth value of the component statements the compound statement has a SPECIFIED truth value.

SPECIFICATION defines the connectivity.

logical connectivities	Notation	Meaning	"Condition for truth"
Negation	$\neg P$	not P	P is false.
Conjunction	$P \wedge Q$	P and Q	Both P and Q are true
Disjunction	$P \vee Q$	P or Q	At least one of P or Q is true
Biconditional	$P \Leftrightarrow Q$	P iff Q	Same truth value.
Conditional	$P \Rightarrow Q$	P implies Q	Q is true whenever P is true

· "OR"

Q: Are you taking the midterm OR not?

A: Yes

(logically correct!)

· "and" - Quantifier — Universal

· "or" — Existential

$P \Rightarrow Q$

· If P is true then Q is true

· P is true only if Q is true

· P is sufficient condition for Q

· Q is necessary condition for P

· Conditional statement(s): Meaning changes if P and Q are interchanged.

$P \Rightarrow Q$

hypothesis

conclusion

P	Q	$P \wedge Q$	$P \vee Q$	$P \Rightarrow Q$	$P \Leftrightarrow Q$
T	T	T	T	T	T
T	F		T		
F	T		T	T	
F	F			T	T

P – Sun rises in the west

Q – class attends WOM

Logical Equivalences

P	$\neg(\neg P)$
$P \vee Q$	$Q \vee P$
$P \wedge Q$	$Q \wedge P$
$\neg(P \wedge Q)$	$\neg P \vee \neg Q$
$\neg(P \vee Q)$	$\neg P \wedge \neg Q$

$\neg(P \Rightarrow Q)$	$P \wedge (\neg Q)$
$P \Leftrightarrow Q$	$P \Rightarrow Q \wedge Q \Rightarrow P$
$P \vee Q$	$(\neg P) \Rightarrow Q$
$P \Rightarrow Q$	$\neg Q \Rightarrow \neg P$