Propositions: A statement that is true / false

- Let p, q be propositions

  The proposition $p \wedge q$ is defined by the following truth table: ($\wedge$ = and)

p	q	p∧q
T	T	T
T	F	F
F	T	F
F	F	F

- Let p, q be prop. $p \vee q$ by the following T.T.: ($\vee$ = or)

p	q	p∨q
T	T	T
T	F	T
F	T	T
F	F	F

- Let p be a prop.

  we define $\neg p$ is defined by: if a prop is true then its negation is false ($\neg$ = negation)

- Let p, q be prop $p \to q$

p,q	p→q
T T	T
T F	F
F T	T
F F	T

Let p, q, r be prop.

$P_1 = (q \vee r) \to p$ (q or r)

	2^2 p	2^1 q	2^0 r	q∨r	P_1 ← output
0	T	T	T	T	T
1	T	T	F	T	T
2	T	F	T	T	T
3	T	F	F	F	T
4	F	T	T	T	F
5	F	T	F	T	F
6	F	F	T	T	F
7	F	F	F	F	T

Disjunctive Normal Form (DNF)

disjunction

$P_1 \equiv (p \wedge q \wedge r) \vee$

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

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

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

$((\neg p) \wedge (\neg q) \wedge (\neg r))$

} true statements

Conjuctive Normal Form (CNF)

$P_1 \equiv^{\text{lines}} (p \vee (\neg q) \vee (\neg r)) \wedge$

line 6: $(p \vee (\neg q) \vee r) \wedge$

line 7: $(p \vee q \vee (\neg r) \wedge$

Logical Equivalence

p	q	$p \rightarrow q$	$\neg p$	$(\neg p) \vee q$
T	T	T	F	T
T	F	F	F	F
F	T	T	T	T
F	F	T	T	T

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

logically equivalent

p	q	$\neg(p \wedge q)$	$(\neg p) \vee (\neg q)$
T	T	F	F
T	F	T	T
F	T	T	T
F	F	T	T

$\neg(p \wedge q) \equiv (\neg p) \wedge (\neg q)$

$\neg(p \vee q) \equiv (\neg p) \vee (\neg q)$

} DeMorgan

$P_5 = (\neg q) \rightarrow (\neg p)$

p	q	
T	T	T
T	F	F
F	T	T
F	F	F

$\equiv p \rightarrow q$