L5 31st Jan 2022

31 January 2022 10:01

Laws of Propositional calculus :-

1) Commutative Laws :-
   i) $p \vee q \equiv q \vee p$
   ii) $p \wedge q \equiv q \wedge p$

$AB \neq BA$

2) Associative Laws :-
   i) $p \vee (q \vee s) \equiv (p \vee q) \vee s$
   ii) $p \wedge (q \wedge s) \equiv (p \wedge q) \wedge s$

3) Distributive Laws
   i) $p \vee (q \wedge s) \equiv (p \vee q) \wedge (p \vee s)$
   ii) $p \wedge (q \vee s) \equiv (p \wedge q) \vee (p \wedge s)$

4) De Morgan's Laws
   i) $\sim(p \vee q) \equiv \sim p \wedge \sim q$
   ii) $\sim(p \wedge q) \equiv \sim p \vee \sim q$

Which of the following represents: ~A (negation of A) if A stands for "I like badminton but hate maths"?

$p \wedge q$

a) I hate badminton and maths
b) I do not like badminton or maths
c) I dislike badminton and love maths
d) I hate badminton or like maths

A :- $p \wedge q$

$\sim A$:- $\sim(p \wedge q)$

$\equiv \sim p \vee \sim q$

Which of the following statements is the negation of the statements "4 is odd or -9 is positive"?

a) 4 is even or -9 is not negative
b) 4 is odd or -9 is not negative
c) 4 is even and -9 is negative
d) 4 is odd and -9 is not negative

$\sim(p \vee q)$

$\equiv \sim p$ and $\sim q$

(5) Identity Laws

i) $p \wedge T \equiv p$

ii) $p \vee F \equiv p$

p	F	p	T	$p \wedge T$	$p \vee T$
T	F	T	T	T	T
F	F	F	T	F	T

(6) Domination Laws

i) $p \vee T \equiv T$

ii) $p \wedge F \equiv F$

$p \wedge F$	F	p	T	$p \vee T$
F	F	T	T	T
F	F	F	T	T

(7) Idempotent Laws :-

i) $p \wedge p \equiv p$

ii) $p \vee p \equiv p$

p	p	$p \wedge p$	$p \vee p$
T	T	T	T
F	F	F	F

(8) Negation Laws

i) $p \wedge \sim p \equiv F$

ii) $p \vee \sim p \equiv T$

p	$\sim p$	$p \wedge \sim p$	$p \vee \sim p$
T	F	F	T
F	T	F	T

(9) Double negation Law :-

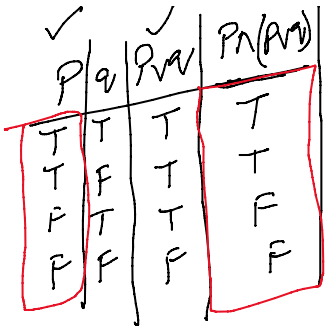
$\sim(\sim p) \equiv p$

(10) Absorption Laws :-

i) $p \vee (p \wedge q) \equiv p$

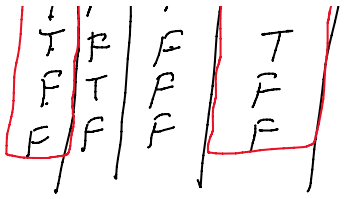
p	q	$p \wedge q$	$p \vee (p \wedge q)$
T	T	T	T
T	F	F	T
F	T	F	F

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



p	q	p∨q	p∧(p∨q)
T	T	T	T
T	F	T	T
F	T	T	F
F	F	F	F

ii) $p \wedge (p \vee q) \equiv p$



T	F	F	T
F	T	F	F
F	F	F	F

2. De Morgan Law states that

(a) $\sim(p \wedge q) \equiv \sim p \vee \sim q$ (b) $\sim(p \wedge q) \equiv \sim p \wedge \sim q$ (c) $(p \wedge q) \equiv \sim p \vee \sim q$ (d) None of these

Which of the following statement is correct?

a) $p \vee q \equiv q \vee p$ Commutative

b) $\neg(p \wedge q) \equiv \neg p \vee \neg q$ De Morgan Law

c) $(p \vee q) \vee r \equiv p \vee (q \vee r)$ Associative Laws

d) All of mentioned

Conditional propositions

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

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

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

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

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

$(p \rightarrow q) \wedge (p \rightarrow r) \equiv p \rightarrow (q \wedge r)$

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

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

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

Biconditional

$p \leftrightarrow q \equiv (p \rightarrow q) \wedge (q \rightarrow p)$

$p \leftrightarrow q \equiv \neg p \leftrightarrow \neg q$

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

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

2. $p \rightarrow q$ is logically equivalent to:

a) $\neg p \vee \neg q$

b) $p \vee \neg q$

c) $\neg p \vee q$

d) $\neg p \wedge q$