1.2 Truth Tables Problems

Sunday, April 6, 2025 8:09 AM

2. a) $\neg p \vee Q$

p	q	$\neg p$	$\neg p \vee Q$
T	T	F	T
T	F	F	F
F	T	T	T
F	F	T	T

b)

S	G	$\neg S$	$\neg G$	$S \vee G$	$\neg S \vee \neg G$	$(S \vee G) \wedge (\neg S \vee \neg G)$
T	T	F	F	T	F	F
T	F	F	T	T	T	T
F	T	T	F	T	T	T
F	F	T	T	F	T	F

2. a)

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

b)

P	Q	K	$\neg P$	$P \vee Q$	$\neg P \vee K$
T	T	T	F	T	T
T	T	F	F	T	F
T	F	T	F	T	T

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

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

T
F
F
T
T
F
F
T

3. $P \dagger Q$ is exclusive or

a)

P	Q	$P \dagger Q$
T	T	F
T	F	T
F	T	T
F	F	F

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

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

4. Want $P \vee Q$ using $\neg, \wedge$, sol: $\neg(\neg P \wedge \neg Q)$

P	Q	$\neg P$	$\neg Q$	$\neg P \wedge \neg Q$	$\neg(\neg P \wedge \neg Q)$
T	T	F	F	F	T
T	F	F	T	F	T
F	T	T	F	F	T
F	F	T	T	T	F

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

5. $p \downarrow q$ neither p nor q

a)

p	q	$p \downarrow q$
T	T	F
T	F	F
F	T	F
F	F	T

b)

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

c) use $\downarrow$ to create $\neg p$, $p \vee q$, $p \wedge q$

$p \downarrow q$	$(p \downarrow q) \downarrow (p \downarrow q)$	p	$p \downarrow p$
F	T	T	F
F	T	F	F
F	T		
T	F		

$p \vee q$ $\neg p$

$(p \downarrow q) \downarrow (p \downarrow q)$

T
T
T
F

$p \wedge q$

b. $p \mid q$ means p and q are both not true

a)

p	q	$p \mid q$
T	T	F
T	F	F
F	T	F
F	F	T

b) equivalent $p \mid q$ using $\wedge, \vee, \neg$

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

c). use $\mid$ to create $\neg p$, $p \vee q$, $p \wedge q$

$p \mid q$	p	$p \mid p$	$(p \mid q) \mid (p \mid q)$
F	T	F	T
T	F	T	F
T			F
T			F

$\neg p$ $\qquad$ $p \wedge q$

$((p \mid q) \mid (p \mid q)) \mid ((p \mid q) \mid (p \mid q))$

F
T
T
T

$\neg(p \wedge q)$

$\lceil (((p \mid q) \mid (p \mid q)) \mid (((p \mid p) \mid (p \mid p)) \mid ((p \mid q) \mid (p \mid q))) \rceil \mid \mid$

$[((p|q)|(p|q))|((p|q)|(p|q))]|[(p|q)|(p|q)]$

$[((p|q)|(p|q))|((p|q)|(p|q))]$

F
T
T
F

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

7. J_m: wins math Junc
P_m: wins math Pete
J_c: wins chemistry Junc
P_c: win chemistry Pete

$\neg(J_m \wedge P_m)$
$P_m \vee P_c$

$\therefore$ P_c

J_m	J_c	P_m	P_c	$J_m \wedge P_m$	$P_m \vee P_c$	
T	T	T	T	T	T	✓
F	T	T	F	T	T	
T	F	F	T	F	T	
F	F	T	T	F	T	
T	T	F	F	F	F	
F	T	T	F	F	F	
T	F	F	T	F	T	
F	F	F	T	F	T	

$\neg(Jm \wedge Pm)$