

## 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	T
F	T	T	T
F	F	T	T

b)

$s$	$g$	$\neg s$	$\neg g$	$s \vee g$	$\neg s \vee \neg g$
T	T	F	F	T	F
T	F	F	T	T	T
F	T	T	F	T	T
F	F	T	T	F	T

$(s \vee g) \wedge (\neg s \vee \neg g)$

F  
F  
T  
T  
F

2. a)  $p \vee q$

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

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

F  
F  
T  
T

b)

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

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

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

T
F
T
T
F
F
T
F

3.  $P \oplus Q$  is exclusive or

a)

P	Q	$P \oplus Q$
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	T	T	F	T
F	T	T	F	F	T
F	F	T	T	T	F

S.  $p \downarrow Q$  neither  $p$  nor  $q$

a)  $p \quad Q \quad p \downarrow Q$

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

b)  $p \vee Q \quad \neg(p \vee Q)$

T	F
T	F
T	F
F	T

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

$p \downarrow Q \quad (p \downarrow Q) \downarrow (p \downarrow Q) \quad p \quad p \downarrow p$

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

$p \vee Q$

$\neg p$

$(p \downarrow Q) \downarrow (p \downarrow Q)$

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). vsc 1 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	T	F	F
F	F	T	F

$\neg p$

$p \wedge q$

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

F  
T  
T  
T

$\neg(p \wedge q)$

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

$$\begin{aligned} & [((p|q)|(p|q))|((p|q)|(p|q))|(p|q)|(p|q)]| \\ & [((p|q)|(p|q))|((p|q)|(p|q))|(p|q)|(p|q))] \\ & \quad \quad \quad \begin{matrix} F \\ F \\ F \\ F \end{matrix} \\ & (p \wedge q) \wedge \neg (p \wedge q) \end{aligned}$$

7. Jim wins math Jane  
 Pam wins math Pete  
 Jane wins chemistry Jane  
 Pete wins chemistry Pete

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

$$P_m \vee P_c$$

$$\frac{J_m}{\therefore P_c}$$

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

✓  
X

[illegible]

F  
T  
+  
F  
F  
T  
F  
F

T  
T  
T  
T  
T  
T  
T

TTTTTT

1111111

T  
T  
T  
F  
T  
F  
T  
F

$$\neg (\exists m \wedge P_m)$$

F  
E  
T  
F  
T  
T  
T  
T  
E  
T  
T  
T  
T  
T  
T