

CPSC 120 LOGIC EXERCISES (SOME SOLUTIONS)

(2)

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

Tautology

(e)

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

(4) (b)

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

$\neg(\neg p \wedge \neg q) \equiv p \vee q$ because they have the same truth values for every case in the truth table.

ALSO $\neg(\neg p \wedge \neg q) \equiv \neg(\neg p) \vee \neg(\neg q) \equiv p \vee q$ (By De Morgan's law)

4(e)

P	q	$P \wedge q$	$\sim(P \wedge q)$	$\sim(P \wedge q) \vee P$	$\sim(\sim(P \wedge q) \vee P)$
T	T	T	F	T	F
T	F	F	T	T	F
F	T	F	T	T	F
F	F	F	T	T	F

$\equiv \text{F}$ (always false - a contradiction)

(7) (a) $\text{age} \geq 18 \ \&\& \ \text{age} \leq 21$

(b) $\text{age} < 18 \ \&\& \ \text{age} > 10$

(c) $\neg \text{answer.equals("Yes")} \ \&\& \ \neg \text{answer.equals("No")}$
 OR $\neg (\text{answer.equals("Yes")} \ \|\ \text{answer.equals("No")})$

(f) $\text{age} > 21 \ \&\& \ (\text{discountCard} \ \|\ \text{answer.equals("No")})$

(8) (a) $\text{age} < 18 \ \|\ \text{age} > 21$

(b) $\text{age} \geq 18 \ \|\ \text{age} \leq 10$

(d) $\text{answer.equals("Yes")} \ \|\ \text{answer.equals("No")}$

(f) $\text{age} \leq 21 \ \|\ \neg (\text{discountCard} \ \&\& \ \neg \text{answer.equals("No")})$