Discrete Math: Homework 1

Tuesday/Thursday 11:00-12:15, Phillips 383

Reese Lance - Section 003

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Unit 1.1

#2

a) Not declarative, a command.

b) Not declarative, a question.

c) Is a proposition, not true: there are black flies in Maine.

d) Not declarative, truth value can change based on x.

e) Is a proposition, not true; the moon is not made of cheese.

f) Not declarative, truth value can change based on n.

#4

a) Janice does not have more Facebook friends than Juan.

b) Quincy is not smarter than Venkat.

c) Zelda does not drive more miles to school than Paola.

d) Briana does not sleep longer than Gloria.

#10

Let p and q be the propositions:

p: I bought a lottery ticket this week.

q: I won the million dollar jackpot.

Express each of these propositions as an English sentence.

a) I did not buy a lottery ticket this week.

b) I bought a lottery ticket this week or I won the million dollar jackpot.

c) If I bought a lottery ticket this week, then I won the million dollar jackpot.

d) I bought a lottery ticket this week and I won the million dollar jackpot.

e) I bought a lottery ticket this week if and only if I won the million dollar jackpot.

f) If I did not buy a lottery ticket this week, then I didn't win the million dollar jackpot.

g) I did not buy a lottery ticket this week and I did not win the million dollar jackpot.

h) I did not buy a lottery ticket this week, or I did buy a lottery ticket this week and won the million dollar jackpot.

#18

a) Both equations are true, therefore True.

b) One equation is false and one is true, therefore False.

c) Both propositions are false, therefore True.

d) One equation is false and one is true, therefore False.

#20

a) Both conditions are false, therefore the statement is true.

b) Both conditions are false, therefore the statement is true.

c) Since p is true and q is false, the statement is false.

d) Both conditions are true, therefore the statement is true.

#22

a) Inclusive or, you need proficiency in either language or both.

b) Exclusive or, you can have either soup or salad, but not both.

c) Inclusive or, you need either form of identification or both.

d) Exclusive or, luckily you cannot both publish and perish.

Unit 1.3

#4b

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

Since the columns are identical the law is true.

#6

Use a truth table to verify the first De Morgan law

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

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

#8

Use De Morgan's laws to find the negation of each of the following statements.

a) Kwame will take a job in industry or go to graduate school.

Kwame will not take a job in the industry and will not go to graduate school.

b) Yoshiko knows Java and calculus.

Yoshiko does not know Joava or does not know calculus.

#32

Show that $p \leftrightarrow q$ and $\neg p \leftrightarrow \neg q$ are logically equivalent.

p	q	$\neg p$	$\neg q$	$p \leftrightarrow q$	$\neg p \leftrightarrow \neg q$
T	T	F	F	T	T
T	F	F	T	F	F
F	T	T	F	F	F
F	F	T	T	T	T

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