

Problems from Chapter 1.1(6th Edition) Total Points: 85**Problem 2 (6 points)**

- a) Not a proposition; It's a command.
- b) Not a proposition; It's a question.
- c) False proposition;
- d) Not a proposition; Truth value depends on x.
- e) False proposition
- f) Not a Proposition; Truth Value depends on n.

Problem 4 (8 points)

- a) $\neg p$ -- I did not buy a lottery ticket this week.
- b) $p \vee q$ -- Either I bought a lottery ticket this week or I won the million dollar jackpot on Friday.
- c) $p \rightarrow q$ -- If I bought a lottery ticket this week, then I won the million dollar jackpot on Friday.
- d) $p \wedge q$ -- I bought a lottery ticket this week and I won the million dollar jackpot on Friday.
- e) $p \leftrightarrow q$ -- I bought a lottery ticket this week if and only if I won the million dollar jackpot on Friday.
- f) $\neg p \rightarrow \neg q$ -- If I did not buy a lottery ticket this week, then I did not win the million dollar jackpot on Friday.
- g) $\neg p \wedge \neg q$ -- I did not buy a lottery ticket this week, and I did not win the million dollar jackpot on Friday.
- h) $\neg p \vee (p \wedge q)$ -- Either I did not buy a lottery ticket this week, or else I bought a lottery ticket this week and I won the million dollar jackpot on Friday.

Problem 6 (8 points)

- a) The election is not decided.
- b) The election is decided, or the votes have been counted.
- c) The election is not decided, and the votes have been counted.
- d) If the votes have been counted, then the election is decided.
- e) If the votes have not been counted, then the election is not decided.
- f) If the election is not decided, then the votes have not been counted.
- g) The election is decided if and only if the votes have been counted.
- h) Either the votes have not been counted or else the election is not decided and the votes have been counted. (*Either* and *else* are used to incorporate parentheses)

Problem 10 (12 points)

- a) You get an A in this class, but you do not do every exercise in this book. -- $r \wedge \neg q$

- b) You get an A on the final, you do every exercise in this book, and you get an A in this class. -- $p \wedge q \wedge r$
- c) To get an A in this class, it is necessary for you to get an A on the final. -- $r \rightarrow p$
- d) You get an A on the final, but you don't do every exercise in this book; nevertheless, you get an A in this class. -- $p \wedge \neg q \wedge r$
- e) Getting an A on the final and doing every exercise in this book is sufficient for getting an A in this class. -- $(p \wedge q) \rightarrow r$
- f) You will get an A in this class if and only if you either do every exercise in this book or you get an A on the final. -- $r \Leftrightarrow (q \vee p)$

Problem 20 (8 points)

It is important to first identify p and q and use them to rephrase the statement in the form 'if p then q' in English.

- If I am to remember to send you the address, then you will have to send me an email. (Reworded to get the tenses right)
- If you were born in the United States, then you are a citizen of this country.
- If you keep your textbook then it will be a useful reference.
- If their goalie plays well, the Red Wings will win the Stanley cup.
- If you got the job then you had the best credentials
- If there is a storm, the beach erodes
- If you can log onto the server, you have a valid password.
- If you do not begin your climb too late, then you will reach the summit.

Problem 24 (9 points)

- Converse: If I stay home, then it will snow tonight. Contrapositive: If I do not stay at home, then it will not snow tonight. Inverse: If it does not snow tonight, then I will not stay at home.
- Converse: Whenever I go to the beach, it is a sunny summer day. Contrapositive: Whenever I do not go to the beach, it is not a sunny summer day. Inverse: Whenever it is not a sunny summer day, I do not go to the beach.
- Converse: If I sleep until noon, then I stayed up late. Contrapositive: If I do not sleep until noon, then I did not stay up late. Inverse: If I don't stay up late, then I don't sleep until noon.

Problem 28 (18 points)

a)

p	$\neg p$	$p \rightarrow \neg p$
T	F	F
F	T	T

b)

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

c)

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

d)

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

e)

p	q	$\neg p$	$q \rightarrow \neg p$	$p \leftrightarrow q$	$(q \rightarrow \neg p) \leftrightarrow (p \leftrightarrow q)$
T	T	F	F	T	F
T	F	F	T	F	F
F	T	T	T	F	F
F	F	T	T	T	T

f)

p	q	$\neg q$	$p \leftrightarrow q$	$p \leftrightarrow \neg q$	$(p \leftrightarrow q) \oplus (p \leftrightarrow \neg q)$
T	T	F	T	F	T
T	F	T	F	T	T
F	T	F	F	T	T
F	F	T	T	F	T

Problem 38 (8 points)

a) $1\ 1000 \wedge (0\ 1011 \vee 1\ 1011) = 1\ 1000 \wedge 1\ 1011 = 1\ 1000$

b) $(0\ 1111 \wedge 1\ 0101) \vee 0\ 1000 = 0\ 0101 \vee 0\ 1000 = 0\ 1101$

c) $(0\ 1010 \oplus 1\ 1011) \oplus 0\ 1000 = 1\ 0001 \oplus 0\ 1000 = 1\ 1001$

d) $(1\ 1011 \vee 0\ 1010) \wedge (1\ 0001 \vee 1\ 1011) = 1\ 1011 \wedge 1\ 1011 = 1\ 1011$

Problem 48 (8 points)

a) $r \wedge \neg p$

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

c) $\neg r \rightarrow \neg q$

d) $(\neg p \wedge r) \rightarrow q$