Studies Logic 2

1) You may choose from three courses on a lunchtime menu at a restaurant.

s: you choose a salad,
m: you choose a meat dish (main course),
d: you choose a dessert.

You choose a **two** course meal which **must** include a main course and either a salad or a dessert, but not both.

(a) Write the sentence above using logic symbols. *[2 marks]*

(b) Write in words $s \Rightarrow \neg d$. *[2 marks]*

(c) Complete the following truth table. *[2 marks]*

s	d	$\neg s$	$\neg s \Rightarrow d$
T	T		
T	F		
F	T		
F	F		

2) The truth table below shows the truth-values for the proposition

$$p \veebar q \Rightarrow \neg p \veebar \neg q$$

p	q	$\neg p$	$\neg q$	$p \veebar q$	$\neg p \veebar \neg q$	$p \veebar q \Rightarrow \neg p \veebar \neg q$
T	T	F	F		F	
T	F	F		T	T	T
F	T	T	F	T	T	T
F	F	T	T	F		T

(a) Explain the distinction between the compound propositions, $p \veebar q$ and $p \vee q$.

(b) Fill in the four missing truth-values on the table.

(c) State whether the proposition $p \veebar q \Rightarrow \neg p \veebar \neg q$ is a tautology, a contradiction or neither.

3) Two logic propositions are given

p: *Dany goes to the cinema*
q: *Dany studies for the test.*

(a) Write in words the proposition

$$p \veebar q\,.$$

(b) Given the statement ***s***: *"If Dany goes to the cinema then Dany doesn't study for the test"*.

(i) Write ***s*** in symbolic form.

(ii) Write in symbolic form the contrapositive of part (b)(i).

4) Consider the statements

p : The sun is shining.
q : I am wearing my hat.

(a) Write down, in words, the meaning of $q \Rightarrow \neg p$.

(b) Complete the truth table.

p	q	$\neg p$	$q \Rightarrow \neg p$
T	T		
T	F		
F	T		
F	F		

(c) Write down, in symbols, the converse of $q \Rightarrow \neg p$.

5) Complete the Truth Table for the compound proposition $(p \wedge \neg q) \Rightarrow (p \vee q)$.

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

6) Consider the following logic statements:

p: the train arrives on time
q: I am late for school

(a) Write the expression $p \Rightarrow \neg q$ as a logic statement.

(b) Write the following statement in logic symbols:
"The train does not arrive on time and I am not late for school."

(c) Complete the following truth table.

p	q	$\neg p$	$\neg q$	$p \Rightarrow \neg q$	$\neg p \wedge \neg q$
T	T	F	F	F	F
T	F	F	T	T	_
F	T	T	F	_	_
F	F	T	T	T	T

(d) Are the two compound propositions $(p \Rightarrow \neg q)$ and $(\neg p \wedge \neg q)$ logically equivalent?

7) Let p and q be the statements:

p : *Sarah eats lots of carrots.*
q : *Sarah can see well in the dark.*

Write the following statements in words.

(a) $p \Rightarrow q$.

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

(c) Write the following statement in symbolic form.

If Sarah cannot see well in the dark, then she does not eat lots of carrots.

(d) Is the statement in part (c) the *inverse*, the *converse* or the *contrapositive* of the statement in part (a)?