

Ch 9 Review

Mixed examination practice

Exam-style questions

1. Consider the following logic statements:

p : My laptop is broken.

q : My laptop is fixed.

r : I will finish writing up my Portfolio task.

(a) Write in words the following symbolic statements;

(i) $\neg q \wedge \neg r$

(ii) $q \Rightarrow r$

(iii) $r \Leftrightarrow q$.

(b) Write the following statements, using symbolic notation:

(i) My laptop is broken and it is not fixed.

(ii) My laptop is broken and I will not finish writing up my Portfolio task.

2. Consider the following statements:

p : New Year is approaching.

q : I will shop for presents.

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

(b) Copy and complete the truth table.

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

3. Consider the following logic statements:

p : I do not save enough money.

q : I buy a new car.

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

(b) Write the following statement in logic symbols:

'I save enough money and I do not buy a new car.'

(c) Copy and complete the truth table.

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

(d) Is $\neg p \wedge \neg q$ logically valid?

4. For each of the statements, write in words the corresponding:

(i) inverse (ii) converse (iii) contrapositive.

(a) If Elliot passes his driving test then his dad will buy him a new car.

(b) If it snows heavily tonight then the roads will not be busy tomorrow morning.

(c) If the recession continues then unemployment will remain high.

5. Consider the two propositions

p : Ali goes to the Homework Club.

q : Ali goes home early.

Nadia says: 'If Ali goes to the Homework Club, then Ali does not go home early.'

(a) Write Nadia's statement in symbolic form.

(b) Write, in symbolic form, the contrapositive of Nadia's statement.

6. Three logic propositions are given below:

p : x is a polygon.

q : x has equal sides and equal angles.

r : x is a regular polygon.

note: A regular polygon has equal sides and equal angles.

Write in words the following symbolic statements and indicate whether they are true or false:

(a) $q \Rightarrow r$ (b) $r \Leftrightarrow (p \wedge q)$ (c) $p \Leftrightarrow q$.

7. Let p and q be the statements

p : Marco is a member of the debating society.

q : Marco enjoys debating.

(a) Consider the following logic statement:

'If Marco is a member of the debating society then he enjoys debating.'

(i) Write down in words the inverse of the statement.

(ii) Write down in words the converse of the statement.

(b) Construct truth tables for the following statements:

(i) $p \Rightarrow q$ (ii) $\neg p \Rightarrow \neg q$

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

(c) Which of the statements in part (b) are logically equivalent?

Past paper questions

1. 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	

[Total 8 marks]

[Nov 2005, Paper 1, Question 11] (© IB Organization 2005)

2. (a) Copy and complete the table below by filling in the three empty columns.

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

[3 marks]

(b) What word is used to describe the argument $(p \vee q) \wedge \neg p \Rightarrow q$?

[1 mark]

[Total 4 marks]

[May 2005, Paper 2, Question 3(ii)] (© IB Organization 2005)

3. The truth table below shows the truth-values for the proposition

$$p \vee q \Rightarrow \neg p \vee \neg q.$$

p	q	$\neg p$	$\neg q$	$p \vee q$	$\neg p \vee \neg q$	$p \vee q \Rightarrow \neg p \vee \neg q$
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, $p \vee q$ and $\neg p \vee \neg q$.
 (b) Fill in the four missing truth-values on the table.
 (c) State whether the proposition $p \vee q \Rightarrow \neg p \vee \neg q$ is a tautology, a contradiction or neither.

[Total 6 marks]

[May 2007, Paper 1, Question 4] (© IB Organization 2007)

4. (a) (i) Complete the truth table below.

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

- (ii) State whether the compound propositions $\neg(p \wedge q)$ and $\neg p \vee \neg q$ are equivalent. [4 marks]

Consider the following propositions.

p : Amy eats sweets

q : Amy goes swimming.

- (b) Write, in symbolic form, the following proposition.

Amy either eats sweets or goes swimming, but not both.

[2 marks]

[Total 6 marks]

[May 2008, Paper 1, TZ2, Question 1] (© IB Organization 2008)