1.

Consider the following logic propositions:

p: Sean is at school

q: Sean is playing a game on his computer.

(a) Write in words, $p \veebar q$.   [2 marks]

(b) Write in words, the converse of $p \Rightarrow \neg q$.   [2 marks]

(c) Complete the following truth table for $p \Rightarrow \neg q$.   [2 marks]

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

Working:

Answers:

(a) _____

_____

_____

_____

(b) _____

_____

_____

2.

Let p and q represent the propositions

p: food may be taken into the cinema

q: drinks may be taken into the cinema

(a)   Complete the truth table below for the symbolic statement $\neg(p \vee q)$.   *[2 marks]*

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

(b)   Write down in words the meaning of the symbolic statement $\neg(p \vee q)$.   *[2 marks]*

(c)   Write in symbolic form the compound statement: *[2 marks]*

"no food and no drinks may be taken into the cinema".

Working:

Answers:

(b) _____

_____

_____

(c) _____

3.
Consider the statements

p: The numbers x and y are both even.

q: The sum of x and y is an even number.

(a)   Write down, in words, the statement $p \Rightarrow q$.   *[2 marks]*

(b)   Write down, in words, the inverse of the statement $p \Rightarrow q$.   *[2 marks]*

(c)   State whether the inverse of the statement $p \Rightarrow q$ is always true. Justify your
       answer.   *[2 marks]*

Working:

Answers:

(a)   . . . .

. . . .

(b)   . . . .

. . . .

(c)   . . . .

. . . .

4.

Consider the following statements about the quadrilateral ABCD

q: ABCD has four equal sides s: ABCD is a square

(a)   Express in words the statement, $s \Rightarrow q$.   *[2 marks]*

(b)   Write down in words, the inverse of the statement, $s \Rightarrow q$.   *[2 marks]*

(c)   Determine the validity of the argument in (b). Give a reason for your decision.   *[2 marks]*

Working:

Answers:

(a) ....

....

(b) ....

....

(c) ....

....

5.

Consider two propositions p and q.

(a) Complete the truth table below.   *[4 marks]*

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

(b) Decide whether the compound proposition

$$(p \Rightarrow \neg q) \Leftrightarrow (\neg p \Rightarrow q)$$

is a tautology. State the reason for your decision.   *[2 marks]*

Working:

Answer:

(b) _____

_____

6.

(a) Complete the truth table.

p	q	$\neg p$	$\neg p \vee q$
T	T		
T	F		
F	T		
F	F		

[2 marks]

Consider the propositions p and q:

p: *x is a number less than 10.*
q: *x^2 is a number greater than 100.*

(b) Write in words the compound proposition $\neg p \vee q$.　　　　　　　　　　*[2 marks]*

(c) Using part (a), determine whether $\neg p \vee q$ is true or false, for the case where x is a number less than 10 and x^2 is a number greater than 100.　　*[1 mark]*

(d) Write down a value of x for which $\neg p \vee q$ is false.　　　　　　*[1 mark]*

Working:

Answers:

(b) ....

....

(c) ....

(d) ....

7.

(a) Complete the truth table below.

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

[4 marks]

(b) (i) State whether the statement $(p \wedge q) \Rightarrow (\neg p \underline{\vee} q)$ is a logical contradiction, a tautology or neither.

(ii) Give a reason for your answer to part (b)(i). [2 marks]

Working:

Answers:

(b) (i) ....

(ii) ....

....

8.

In a particular school, students must choose at least one of three optional subjects: art, psychology or history.

Consider the following propositions

a: I choose art,
p: I choose psychology,
h: I choose history.

(a)   Write, in words, the compound proposition

$$\neg h \Rightarrow (p \lor a)$$

[3 marks]

(b)   Complete the truth table for $\neg a \Rightarrow p$.   [1 mark]

a	p	$\neg a$	$\neg a \Rightarrow p$
T	T	F	
T	F	F	
F	T	T	
F	F	T	

(c)   State whether $\neg a \Rightarrow p$ is a tautology, a contradiction or neither. Justify your answer.   [2 marks]

Working:

Answers:

(a) ....

....

(c) ....

....