

1. Consider the statement “*If a figure is a square, then it is a rhombus*”.

(a) For this statement, write in words

- (i) its converse;
- (ii) its inverse;
- (iii) its contrapositive.

(b) Only one of the statements in part(a) is true. Which one is it?

(Total 8 marks)

2. Two propositions p and q are defined as follows:

p : *the number ends in zero*

q : *the number is divisible by 5*

(a) Write in words

- (i) $p \Rightarrow q$;
- (ii) the converse of $(p \Rightarrow q)$.

(b) Write in symbolic form

- (i) the inverse of $(p \Rightarrow q)$;
- (ii) the contrapositive of $(p \Rightarrow q)$.

(Total 4 marks)

3. (a) Complete the following truth table.

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

(2)

Consider the propositions

p : Cristina understands logic
 q : Cristina will do well on the logic test.

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

“If Cristina understands logic then she will do well on the logic test”

(2)

- (c) Write down in words the contrapositive of the proposition given in part (b).

(2)

(Total 6 marks)

4. Consider the following propositions

p : The number is a multiple of five.
 q : The number is even.
 r : The number ends in zero.

- (a) Write in words $(q \wedge \neg r) \Rightarrow \neg p$

(3)

- (b) Consider the statement “If the number is a multiple of five, and is not even then it will not end in zero”.

- (i) Write this statement in symbolic form.
(ii) Write the contrapositive of this statement in symbolic form.

(6)

(Total 9 marks)

5. Consider the statement p :

“If a quadrilateral is a square then the four sides of the quadrilateral are equal”.

(a) Write down the inverse of statement p in words.

(2)

(b) Write down the converse of statement p in words.

(2)

(c) Determine whether the converse of statement p is always true. Give an example to justify your answer.

(2)

(Total 6 marks)

6. Consider the following logic propositions:

p : Sean is at school

q : Sean is playing a game on his computer.

(a) Write in words, $p \vee q$.

(2)

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

(2)

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

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

(2)

(Total 6 marks)

7. 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 $q \Rightarrow \neg p$.

(Total 6 marks)

8. Two logic propositions are given

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

- (a) Write in words the proposition

$$p \vee q.$$

- (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).

(Total 6 marks)

9. Let p stand for the proposition “I will walk to school”. Let q stand for the proposition “the sun is shining”.

- (a) Write the following statements in symbolic logic form
- (i) “If the sun is shining then I will walk to school.”
(ii) “If I do not walk to school then the sun is not shining.”

(4)

- (b) Write down, in words, the converse of the statement

“If the sun is shining then I will walk to school.”

(2)

(Total 6 marks)

10. Consider the following logic statements:

p : x is a factor of 6

q : x is a factor of 24

- (a) Write $p \Rightarrow q$ in words. (1)
- (b) Write the converse of $p \Rightarrow q$. (1)
- (c) State if the converse is true or false and give an example to justify your answer. (2)
- (Total 4 marks)**

11. 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)?

(Total 8 marks)

12. (a) The following truth table contains two entries which are incorrect, one in column three and one in column four. Circle the two incorrect entries.
- (b) Fill in the two missing values in column five.
- (c) Which **one** of the following words could you use to describe the statement represented by the values in the last column (number 6)?
- (i) converse
 - (ii) tautology
 - (iii) inverse
 - (iv) contradiction
 - (v) contrapositive

1	2	3	4	5	6
p	q	$p \wedge q$	$\neg p$	$p \vee q$	$(p \vee q) \wedge (\neg p \wedge \neg q)$
T	T	T	F	T	F
T	F	F	F		F
F	T	F	T	T	F
F	F	T	F		F

(Total 8 marks)

13. (a) Solve $2x + 3 = 5$.
(b) Consider the logic statements.

$$p: 2x + 3 = 5 \quad q: x^2 = x$$

The compound proposition $2x + 3 = 5 \Rightarrow x^2 = x$ is given.
Is this compound proposition true?

- (c) Write down the converse of this compound proposition.
(d) Give an example to show that the converse is false.

(Total 8 marks)

14. Let p and q be the statements

p : you watch the music TV channel
 q : you like music

- (a) Consider the following logic statement.

If you watch the music TV channel then you like music.

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

(4)

- (b) Construct truth tables for the following statements:

- (i) $p \Rightarrow q$.
(ii) $\neg p \Rightarrow \neg q$.
(iii) $p \vee \neg q$.
(iv) $\neg p \wedge q$.

(4)

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

(1)

(Total 9 marks)