

TEST A

CHAPTER 3, LOGIC

- _____ 1. Write the truth values for the \rightarrow column in the following table.

<u>p</u>	<u>q</u>	<u>$p \rightarrow (p \Delta q)$</u>
T	T	?
T	F	?
F	T	?
F	F	?

- _____ 2. Show that the statement $(\sim p \vee r) \wedge (q \vee r)$ is equivalent to $(\sim p \wedge q) \vee r$.
- _____ 3. Write the conditions under which the statement, "The day is warm or it is summer time," is a true statement.
- _____ 4. Is the statement, "If $4 + 4 = 8$, then $4 \times 4 = 20$," true or false?

The statement , "**If the weather is rainy, I stay indoors,**" will be used in problems 5-7.

- _____ 5. Write the contrapositive of the given statement.
- _____ 6. Write the converse of the given statement.
- _____ 7. Write the inverse of the given statement.
- _____ 8. If two statements **r** and **s** have the truth values shown in the table, which of the five relationships exist between **r** and **s**?
- | <u>p</u> | <u>q</u> | <u>r</u> | <u>s</u> | |
|----------|----------|----------|----------|--------------------------|
| T | T | T | T | a. $r \rightarrow s$ |
| T | F | T | F | b. $s \Leftrightarrow r$ |
| F | T | F | F | c. $r \Rightarrow s$ |
| F | F | F | F | d. $s \Rightarrow r$ |
| | | | | e. None of these |
- _____ 9. Which of the following are tautologies?
- a. $(p \vee q) \rightarrow (p \wedge q)$ b. $p \wedge \sim p$
- c. $(p \rightarrow q) \Leftrightarrow (\sim p \vee q)$

- _____ 10. Which of the following is a contradiction:
 a. $(p \wedge q) \vee (\sim p \wedge q)$ b. $(p \vee q) \rightarrow p$
 c. $q \vee \sim q$ d. $(p \wedge q) \rightarrow p$
 e. $\sim q \leftrightarrow q$
- _____ 11. Use the given symbols to write the statement:
 "If it is the sixth month of the year (s) then it has thirty days (t)," in symbolic form.
- _____ 12. Use the given symbols to write the statement:
 "Susie likes Paul (p), but Paul does not like Susie ($\sim s$)," in symbolic form.
- _____ 13. Let h be "The test is hard," and p be "I shall pass it." Write in words the statement $\sim(h \vee p)$.
- _____ 14. Let h and p be as in Problem 13. Write in words the statement $\sim h \vee p$.
- _____ 15. Write in words the negation of the statement "I shall drive or I shall walk."
- _____ 16. Write in words the negation of the statement "Some science fiction stories are interesting"
- _____ 17. Write in words the negation of the statement, "All ripe peaches taste good."

The following truth table will be used in Problems 18 and 19.

p	q	$\sim p \wedge q$	$\sim(p \wedge q)$
T	T		
T	F		
F	T		
F	F		

- _____ 18. Write the truth values for the statement $\sim p \wedge q$.
- _____ 19. Write the truth values for the statement $\sim(p \wedge q)$.

_____ 20. Write the truth values for the \wedge column in the following table.

<u>p</u>	<u>q</u>	<u>$(p \Delta q) \wedge (\sim p \Delta \sim q)$</u>
T	T	?
T	F	?
F	T	?
F	F	?

_____ 21. Is the argument $p \vee q$ valid or invalid?
 $\sim q$

 $\therefore p$

_____ 22. Select the argument that is **not** valid:

- a. All fish can swim and all trout are fish.
Therefore, all trout can swim.
- b. All cats have fur and all Siamese are cats.
Therefore, all Siamese have fur.
- c. All fish can swim and trout can swim.
Therefore, all trout are fish.
- d. Every cat is an animal.
The Siamese is a cat.
Therefore, the Siamese is an animal.
- e. Every book has covers.
The dictionary is a book.
Therefore, the dictionary has covers.

_____ 23. Use all premises to supply a valid conclusion for the argument:

All ball players read comics.
All kids play ball.
Patsy is a kid.

_____24. Write the following argument in symbolic form.

If the weather is bad (b) , Josie will not go on a picnic ($\sim g$).

Josie will go on a picnic.

Therefore, the weather is not bad.

_____25. Draw a switching network corresponding to the statement $\sim p \rightarrow q$.

TEST B

CHAPTER 3, LOGIC

1. The correct entries for the \rightarrow column of the following table are

p	q	$p \rightarrow (p \Delta q)$	
T	T	?	a. F T T F
T	F	?	b. F F F T
F	T	?	c. T T T T
F	F	?	d. F F F F
			e. T T T F

2. Which of the following statements is equivalent to $(\sim p \wedge q) \vee r$?
- a. $\sim p \wedge (q \vee r)$ b. $(\sim p \vee r) \wedge (q \vee r)$
 c. $\sim(p \wedge \sim q) \vee r$ d. $(\sim p \vee r) \wedge q$ e. $\sim(p \vee r) \wedge \sim q$
3. The statement, "The day is warm, or it is summer time" is true only under the following condition:
- a. The day is warm.
 b. It is summer time.
 c. The day is warm and it is summer time.
 d. The day is warm, or it is summer time, or both.
 e. None of these
4. The statement, "If $4 + 4 = 9$, then $4 \times 4 = 20$," is
- a. True b. False c. A conjunction
 d. A disjunction e. None of these
5. Given the statement, "If the weather is rainy, I stay indoors." Its contrapositive is
- a. If I stay indoors, then the weather is rainy.
 b. If the weather is not rainy, then I do not stay indoors.
 c. If I do not stay indoors, then the weather is not rainy.
 d. The weather is not rainy and I do not stay indoors.
 e. None of these.
6. Which of the statements in Problem 5 is the converse of the original given statement? a b c d e
7. Which of the statements in Problem 5 is the inverse of the original given statement? a b c d e

8. If two statements r and s have the truth values shown in the table, then

p	q	r	s
T	T	T	T
T	F	T	F
F	T	F	F
F	F	F	F

- a. $r \Leftrightarrow s$
- b. $s \Rightarrow r$
- c. $r \Rightarrow s$
- d. $r \rightarrow s$
- e. None of these

9. Which of the following are tautologies?

- | | | |
|--|----------------------|--|
| 1. $(p \vee q) \rightarrow (p \wedge q)$ | 2. $p \wedge \sim p$ | 3. $(p \rightarrow q) \Leftrightarrow (\sim p \vee q)$ |
| a. 1 only | b. 2 only | c. 3 only |
| d. 1 and 2 only | e. 1 and 3 only | |

10. Which of the following is a contradiction:

- | | | |
|--|-------------------------------|--------------------|
| a. $(p \wedge q) \vee (\sim p \wedge q)$ | b. $(p \vee q) \rightarrow p$ | c. $q \vee \sim q$ |
| d. $(p \wedge q) \rightarrow p$ | e. $q \Leftrightarrow \sim q$ | |

11. The argument $p \vee q$ is:

$$\frac{\sim q}{\therefore p}$$

- a. Valid
- b. Invalid
- c. True
- d. False
- e. None of these

12. Select the argument that is **not** valid:

- a. All fish can swim and all trout are fish.
Therefore, all trout can swim.
- b. All fish can swim and trout can swim.
Therefore, all trout are fish.
- c. All cats have fur and all Siamese are cats
Therefore, all Siamese have fur.
- d. Every cat is an animal.
The Siamese is a cat.
Therefore, the Siamese is an animal.
- e. Every book has covers.
The dictionary is a book.
Therefore, the dictionary has covers.

13. Which of the following (if any) is a valid conclusion using all the premises for the argument:

All ball players read comics.
 All kids play ball.
 Patsy is a kid.
 Therefore:

- a. Patsy can play ball. b. Patsy cannot play ball
 c. Patsy reads comics d. Patsy is a good ball player.
 e. No valid conclusion is given
14. Read the following argument. Then select its symbolic form.

If the weather is bad (p), Josie will not go on a picnic (~ q).
 Josie will go on a picnic.
 Therefore, the weather is not bad.

- a. $\frac{p \rightarrow \sim q}{q} \therefore \sim p$ b. $\frac{p \rightarrow q}{\sim p} \therefore \sim q$ c. $\frac{p \rightarrow q}{q} \therefore p$ d. $\frac{p \rightarrow q}{\sim q} \therefore \sim q$ e. $\frac{p \rightarrow q}{q} \therefore \sim p$

15. The statement $\sim p \rightarrow q$ corresponds to the switching network

- a. $A - P - Q' - B$ b. $A - P' - Q - B$ c. $A - \left[\begin{array}{c} \text{---} P \text{---} \\ \text{---} Q \text{---} \end{array} \right] - B$
 d. $A - \left[\begin{array}{c} \text{---} P' \text{---} \\ \text{---} Q \text{---} \end{array} \right] - B$ e. None of these

16. Using the given symbols, the statement, "If it is the sixth month of the year (s), then it has 30 days (t)," is written:

- a. $s \wedge t$ b. $s \leftrightarrow t$ c. $t \rightarrow s$
 d. $s \rightarrow t$ e. None of these

17. Using the given symbols, the statement, "Susie likes Paul (p), but Paul does not like Susie (~s)," is written:

- a. $s \rightarrow p$ b. $p \rightarrow s$ c. $s \wedge \sim p$
 d. $p \wedge \sim s$ e. $s \vee \sim p$

18. Let h be "The test is hard," and p be "I shall pass it." The statement $\sim(h \wedge p)$ is:
- The test is not hard and I shall not pass it.
 - It is not the case that the test is hard and I shall pass it.
 - The test is not hard, and I shall pass it.
 - The test is not hard, but I shall not pass it.
 - None of these
19. Let h and p be as in Problem 18. The statement $\sim h \wedge p$ is which one of the statements in Problem 18?
- a b c d e
20. The negation of the statement, "I shall drive or I shall walk," is:
- I shall not drive and I shall not walk.
 - I shall not drive or I shall not walk.
 - I shall drive and I shall not walk.
 - I shall not drive, but I shall walk.
 - None of these
21. The negation of the statement, "Some science fiction stories are interesting," is:
- Some science fiction stories are not interesting.
 - Not all science fiction stories are interesting.
 - If it is not a science fiction story, then it is not interesting.
 - If it is not a science fiction story, then it is interesting.
 - No science fiction story is interesting.
22. The negation of the statement, "All ripe peaches taste good," is:
- Some ripe peaches do not taste good.
 - No ripe peaches taste good.
 - If it is a ripe peach, then it does not taste good.
 - All ripe peaches do not taste good.
 - If it is not a ripe peach, then it does not taste good.

The following truth table will be used in Problems 23 and 24.

p	q	1	2
T	T	F	F
T	F	F	T
F	T	T	T
F	F	F	T

23. Column 1 gives the truth values of
- | | | |
|-----------------------|----------------------|----------------------|
| a. $p \vee \sim q$ | b. $\sim(p \vee q)$ | c. $\sim p \wedge q$ |
| d. $\sim(p \wedge q)$ | e. $p \wedge \sim q$ | |

24. Column 2 gives the truth values of
- | | | |
|-----------------------|----------------------|----------------------|
| a. $p \vee \sim q$ | b. $\sim(p \vee q)$ | c. $\sim p \wedge q$ |
| d. $\sim(p \wedge q)$ | e. $p \wedge \sim q$ | |

25. The correct entries for the \wedge column of the following table are

p	q	$(p \Delta q) \wedge (\sim p \Delta \sim q)$	
T	T	?	a. FTTF
T	F	?	b. TFFT
F	T	?	c. FTTF
F	F	?	d. TFFF
			e. FTFF