

Name _____

Section _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Decide whether or not the following is a statement.

1) Not all flowers are roses. 1) _____
A) Statement B) Not a statement

2) My favorite baseball team will win the pennant. 2) _____
A) Not a statement B) Statement

Decide whether the statement is compound.

3) If it rains, we won't play soccer. 3) _____
A) Not compound B) Compound

4) The sign read "Not for sale". 4) _____
A) Compound B) Not compound

Write a negation for the statement.

5) No fifth graders play soccer. 5) _____
A) No fifth grader does not play soccer. B) At least one fifth grader plays soccer.
C) All fifth graders play soccer. D) Not all fifth graders play soccer.

6) Some people don't like walking. 6) _____
A) Some people like walking. B) Some people don't like driving.
C) Nobody likes walking. D) Everyone likes walking.

Write a negation of the inequality. Do not use a slash symbol.

7) $x \geq -54$ 7) _____
A) $x \geq 54$ B) $x \leq -54$ C) $x < 54$ D) $x < -54$

Convert the symbolic compound statement into words.

8) p represents the statement "Her name is Lisa." 8) _____

q represents the statement "She lives in Chicago."

Translate the following compound statement into words:

$$p \wedge q$$

- A) If her name is Lisa, she lives in Chicago.
- B) Her name is Lisa and she lives in Chicago.
- C) Her name is Lisa and she doesn't live in Chicago.
- D) Her name is Lisa or she lives in Chicago.

9) p represents the statement : "Students are happy." 9) _____

q represents the statement: "Teachers are happy."

Translate the following compound statement into words:

$$\sim(p \vee \sim q)$$

- A) Students are not happy or teachers are not happy.
- B) It is not the case that students are happy or teachers are not happy.
- C) Students are not happy and teachers are not happy.
- D) It is not the case that students are happy and teachers are not happy.

Let p represent the statement, "Jim plays football", and let q represent the statement "Michael plays basketball".

Convert the compound statement into symbols.

10) Jim does not play football or Michael plays basketball. 10) _____

A) $p \wedge q$

B) $\sim(p \vee q)$

C) $p \vee q$

D) $\sim p \vee q$

11) Jim does not play football or Michael does not play basketball. 11) _____

A) $\sim(p \vee q)$

B) $p \wedge q$

C) $\sim p \wedge \sim q$

D) $\sim p \vee \sim q$

Decide whether the statement is true or false.

12) All whole numbers are real numbers. 12) _____

A) True

B) False

13) There exists a rational number that is an integer. 13) _____

A) True

B) False

Let p represent a true statement and let q represent a false statement. Find the truth value of the given compound statement.

14) $\sim p \vee q$ 14) _____
 A) True B) False

15) $[(\sim p \wedge \sim q) \vee \sim q]$ 15) _____
 A) False B) True

Let p represent a true statement, while q and r represent false statements. Find the truth value of the compound statement.

16) $(p \wedge \sim q) \wedge r$ 16) _____
 A) True B) False

17) $\sim[(\sim p \wedge q) \vee r]$ 17) _____
 A) False B) True

Let p represent $7 < 8$, q represent $2 < 5 < 6$, and r represent $3 < 2$. Decide whether the statement is true or false.

18) $\sim p \vee q$ 18) _____
 A) False B) True

19) $\sim(\sim p \wedge \sim q) \wedge (\sim r \wedge \sim q)$ 19) _____
 A) False B) True

Construct a truth table for the statement.

20) $\sim r \wedge \sim s$ 20) _____

A)

r	s	$(\sim r \wedge \sim s)$
T	T	F
T	F	F
F	T	F
F	F	F

B)

r	s	$(\sim r \wedge \sim s)$
T	T	T
T	F	F
F	T	F
F	F	T

C)

r	s	$(\sim r \wedge \sim s)$
T	T	F
T	F	F
F	T	F
F	F	T

D)

r	s	$(\sim r \wedge \sim s)$
T	T	F
T	F	T
F	T	T
F	F	T

21) $\sim((w \wedge s) \vee t)$

21) _____

A) w	s	t	$\sim((w \wedge s) \vee t)$
T	T	T	F
T	T	F	F
T	F	T	F
T	F	F	T
F	T	T	F
F	T	F	T
F	F	T	F
F	F	F	T

B) w	s	t	$\sim((w \wedge s) \vee t)$
T	T	T	T
T	T	F	F
T	F	T	T
T	F	F	F
F	T	T	T
F	T	F	F
F	F	T	T
F	F	F	F

Use De Morgan's laws to write the negation of the statement.

22) $8 + 4 = 12$ and $10 - 2 \neq 8$

22) _____

- A) $8 + 4 \neq 12$ and $10 - 2 = 8$
- C) $8 + 4 = 12$ and $10 - 2 = 8$

- B) $8 + 4 \neq 12$ or $10 - 2 = 8$
- D) $8 + 4 = 12$ or $10 - 2 \neq 8$

23) Cats are lazy or dogs aren't friendly.

23) _____

- A) Cats are lazy and dogs are friendly.
- C) Cats aren't lazy and dogs are friendly.

- B) Cats aren't lazy or dogs aren't friendly.
- D) Cats aren't lazy or dogs are friendly.

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

Decide whether the statement is true or false.

24) For every real number x , $x < 5$ and $x > 4$.

24) _____

25) For no real number y , $y < 17$ and $y > 19$.

25) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Rewrite the statement using the if...then connective. Rearrange the wording or words as necessary.

26) I'll leave when he arrives.

26) _____

- A) I'll leave when he arrives.
- C) If he arrives, then I'll leave.
- B) If I leave, then he will leave.
- D) If I will leave, then he'll arrive.

Write the compound statement in words.

Let r = "The puppy is trained."

p = "The puppy behaves well."

q = "His owners are happy."

27) $(r \wedge p) \rightarrow q$

27) _____

- A) If the puppy is trained and the puppy behaves well, then his owners are happy.
- B) The puppy is trained and the puppy behaves well if his owners are happy.
- C) If the puppy is trained, then the puppy behaves well and his owners are happy.
- D) If the puppy is trained or the puppy behaves well, then his owners are happy.

Write the compound statement in symbols.

Let r = "The food is good."

p = "I eat too much."

q = "I'll exercise."

28) If the food is good and I eat too much, then I'll exercise.

28) _____

- A) $(r \wedge p) \rightarrow q$
- B) $p \rightarrow (r \wedge q)$
- C) $r \rightarrow (p \wedge q)$
- D) $r \wedge (p \rightarrow q)$

29) I'll exercise if I don't eat too much.

29) _____

- A) $\sim p \rightarrow q$
- B) $\sim p \vee q$
- C) $\sim p \wedge q$
- D) $\sim(p \rightarrow q)$

Given p is true, q is true, and r is false, find the truth value of the statement.

30) $\sim q \rightarrow (p \vee r)$

30) _____

- A) False
- B) True

31) $(\sim p \rightarrow \sim q) \wedge (p \rightarrow \sim r)$

31) _____

- A) True
- B) False

Construct a truth table for the statement.

32) $(p \rightarrow q) \rightarrow (\sim p \vee q)$

32) _____

A)

p	q	$(p \rightarrow q) \rightarrow (\sim p \vee q)$
-----	-----	---

T	T	T
T	F	F
F	T	T
F	F	F

C)

p	q	$(p \rightarrow q) \rightarrow (\sim p \vee q)$
-----	-----	---

T	T	T
T	F	T
F	T	T
F	F	T

B)

p	q	$(p \rightarrow q) \rightarrow (\sim p \vee q)$
-----	-----	---

T	T	F
T	F	T
F	T	F
F	F	F

D)

p	q	$(p \rightarrow q) \rightarrow (\sim p \vee q)$
-----	-----	---

T	T	T
T	F	F
F	T	T
F	F	T

33) $\sim(p \wedge q) \rightarrow \sim(p \vee q)$

33) _____

A)

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

B)

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

C)

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

D)

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

Write the negation of the conditional. Use the fact that the negation of $p \rightarrow q$ is $p \wedge \sim q$.

34) If you can't take the heat, stay out of the kitchen.

34) _____

- A) You can take the heat and stay out of the kitchen.
- B) You can take the heat and do not stay of of the kitchen.
- C) You can't take the heat and do not stay out of the kitchen.
- D) You can take the heat but stay out of the kitchen.

Write an equivalent statement that does not use the if ... then connective. Use the fact that $p \rightarrow q$ is equivalent to $\sim p \vee q$.

35) If you can't win the tournament, then you don't bother playing.

35) _____

- A) You can't win the tournament and you do bother playing.
- B) You can't win the tournament so you don't bother playing.
- C) You can win the tournament or you do bother playing.
- D) You can win the tournament or you don't bother playing.

True or false?

36) When using a truth table, the statement $q \rightarrow p$ is equivalent to $p \rightarrow q$.

36) _____

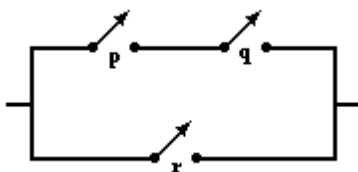
- A) True
- B) False

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

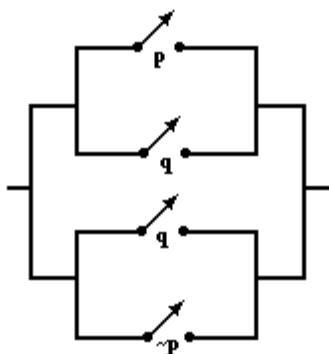
Write a logical statement representing the following circuit. Simplify when possible.

37)

37) _____



38)



38) _____

Draw a circuit representing the following statement as it is given. Simplify if possible.

39) $[(p \wedge \sim r) \vee q] \wedge (q \wedge \sim r)$

39) _____

40) $\sim p \rightarrow [(q \wedge r) \vee \sim p]$

40) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Use an Euler diagram to determine whether the argument is valid or invalid.

41) Not all that glitters is gold.
My ring glitters.
 My ring is not gold.
 A) Valid

B) Invalid

41) _____

42) All cats like fish.
Henry does not like fish.
 Henry is not a cat.
 A) Valid

B) Invalid

42) _____

The argument has a true conclusion. Identify the argument as valid or invalid.

43) $\sqrt{14}$ is less than 14.
7 is less than 14.
 $\sqrt{14}$ is less than 7.
 A) Valid

B) Invalid

43) _____

- 44) All dogs have fur. 44) _____
All cats have fur.
 A cat is not a dog.
 A) Valid B) Invalid

Use a truth table to determine whether the argument is valid.

- 45) $p \rightarrow q$ 45) _____
 $\frac{q}{p}$
 A) Valid B) Invalid

- 46) $\sim q \wedge \sim p$ 46) _____
 $\frac{p \vee \sim q}{\sim q}$
 A) Valid B) Invalid

Determine whether the argument is valid or invalid.

- 47) If I were your friend and you were my soul mate, then I'd never stop liking you. I've stopped liking you. Therefore, I am not your friend or you were not my soul mate. 47) _____
 A) Valid B) Invalid

- 48) If you are infected with the measles, then it can be transmitted. The results are grave and it cannot be transmitted. Therefore, if the results are not grave, then you are infected with the measles 48) _____
 A) Valid B) Invalid

Use the method of writing each premise in symbols in order to write a conclusion that yields a valid argument.

- 49) Smiling people are happy. Alert people are not happy. Careful drivers are alert. Careless drivers have accidents. 49) _____
 A) People who smile have accidents. B) Careful drivers have accidents.
 C) Careful drivers are happy. D) People who smile are alert.

- 50) Hard workers sweat. Sweat brings on a chill. Anyone who doesn't have a cold never felt a chill. Anyone who works doesn't have a cold. 50) _____
 A) Hard workers don't go to work. B) Anyone who sweats works hard.
 C) Hard workers don't get colds. D) Anyone who has a cold works hard.