

## MODULE 2

### Logic

- 1) Which of the following is *not* a statement?
  - a.  $\sqrt{2}$  is a rational number.
  - b. Math is hard.
  - c. Plants require water to live.
  - d. Lake Martin is a man-made lake.
  
- 2) Which type of statement and connective are associated with  $p \vee q$ ?
  - a. Conjunction; and
  - b. Negation; not
  - c. Disjunction; or
  - d. Conditional; if ... then
  
- 3) Which symbol is used for Conjunction?
  - a.  $\vee$
  - b.  $>$
  - c.  $\wedge$
  - d.  $<$
  
- 4) Which of the following is an existential quantifier?
  - a. Few
  - b. All
  - c. None
  - d. Every
  
- 5) Which of the following is a universal quantifier?
  - a. Few
  - b. All
  - c. Some
  - d. At least one
  
- 6) Negate the statement, "I have a black cat."
  - a. I don't have a cat
  - b. Some of my cats are black.
  - c. I have a white cat.
  - d. I do not have a black cat.
  
- 7) Negate the statement, "Some square roots are rational numbers."
  - a. No square roots are rational numbers.
  - b. Some square roots are not rational numbers.
  - c. All square roots are rational numbers.
  - d. Many square roots are rational numbers.

- 8) Construct a truth table for  $p \vee \sim p$ . What word describes the outcome?
- Self-Contradiction
  - Equivalent
  - Tautology
  - Disjoint
- 9) "If you make straight A's, then you will make the Dean's List" is an example of a(n):
- Conjunction
  - Conditional Statement
  - Negation
  - Biconditional Statement
- 10) "You can graduate if and only if you meet the requirements" is an example of a(n):
- Conjunction
  - Conditional Statement
  - Negation
  - Biconditional Statement
- 11) Identify the *consequent* in the conditional statement, "If you don't water the plant, then it will die."
- You water the plant
  - You don't water the plant
  - It will not die
  - It will die
- 12) The conditional statement  $p \rightarrow q$  is *false* only when:
- $p$  and  $q$  are both true
  - $p$  is true and  $q$  is false
  - $p$  and  $q$  are both false
  - $p$  is false and  $q$  is true
- 13)  $p \rightarrow q \equiv ?$
- $\sim p \vee q$
  - $\sim p \wedge q$
  - $p \wedge \sim q$
  - $p \vee \sim q$
- 14) Which connective is associated with a biconditional statement?
- If ... then
  - Or
  - If and only if
  - And

- 15) Negate the quantified statement: "Some politicians are honest."
- Some politicians are not honest.
  - All politicians are honest.
  - All politicians are not honest.
  - At least one politician is honest.
- 16) Negate the quantified statement: "No positive numbers are negative numbers."
- Some positive numbers are negative numbers.
  - Some positive numbers are not negative numbers.
  - All positive numbers are not negative numbers.
  - All positive numbers are negative numbers.
- 17) Use one of De Morgan's laws to negate the statement "I got a promotion or I got a raise."
- I did not get a promotion or I did not get a raise.
  - I did not get a promotion and I did not get a raise.
  - I got a promotion or I did not get a raise.
  - I did not get a promotion but I got a raise.
- 18) Identify the antecedent and the consequent of the conditional statement: "If I have the time, then I will bake a cake."
- Antecedent: I have the time; Consequent: I will bake a cake
  - Both statements are antecedents.
  - Antecedent: I will bake a cake; Consequent: I have the time
  - None of these.
- 19) Write the conditional statement "If I have the time, then I will bake a cake" in its equivalent disjunctive form.
- If I bake then cake, then I have the time.
  - I don't have the time or I won't bake a cake.
  - I have the time and I won't bake a cake.
  - I don't have the time or I would bake a cake.
- 20) Write the *negation* of the conditional statement "If I have the time, then I will bake a cake" in its conjunctive form.
- If I bake then cake, then I have the time.
  - I don't have the time and I won't bake a cake.
  - I have the time and I won't bake a cake.
  - I don't have the time or I would bake a cake.

Use  $p$ ,  $q$ ,  $r$ , and  $s$  as defined below:

$p$ : Today is Thursday

$q$ : It is cold outside

$r$ : I am feeling tired

s: I am not going out for dinner

21) Write in symbolic form: "It is cold outside and I am going out for dinner."

- a.  $q \wedge \sim s$
- b.  $q \wedge s$
- c.  $q \vee \sim s$
- d. none of these

22) Write in symbolic form: "I am not going out for dinner if and only if I am feeling tired."

- a.  $s \rightarrow r$
- b.  $s \leftrightarrow \sim r$
- c.  $s \leftrightarrow r$
- d.  $s \rightarrow \sim r$

23) Write an English sentence:  $(p \wedge (q \vee r)) \rightarrow s$

- a. Today is Thursday, and if it is cold outside, then I am feeling tired or I am not going out for dinner.
- b. If today is Thursday, and it is cold outside or I am feeling tired, then I am not going out for dinner.
- c. Today is Thursday, and it is cold outside or I am feeling tired, if and only if I am not going out for dinner.
- d. If I am not going out for dinner, then today is Thursday, and it is cold outside or I am feeling tired.

24) Write an English sentence:  $\sim p \rightarrow r$

- a. Today is Thursday and I am feeling tired.
- b. If today is not Thursday then I am feeling tired.
- c. Today is not Thursday or I am feeling tired.
- d. Today is not Thursday if and only if I am feeling tired.

Complete the definition with the appropriate term

25) A \_\_\_\_\_ is a statement that is always false.

- a. Conjunction
- b. Tautology
- c. Disjunction
- d. Self-Contradiction

26) A Tautology is a statement that is always:

- a. Existential
- b. True
- c. False
- d. Universal

True or False?

27) Use the truth table of  $p \wedge q$  to determine the truth value of the compound statement "It is raining ( $p$ ) and I forgot my umbrella ( $q$ )" if  $p$  is true and  $q$  is false.

- a. True
- b. False

28) Use a truth table for  $\sim(\sim p \vee q)$  to determine the truth value if both  $p$  and  $q$  are false.

- a. True
- b. False

29) 3 is an odd number or 3 is an even number.

- a. True
- b. False

30)  $\sim(p \vee \sim q) \equiv \sim p \wedge q$

- a. True
- b. False

31) If all cats can ballet dance, then today is Tuesday.

- a. True
- b. False

32) If  $1 + 1 = 2$ , then Miley Cyrus is secretly the Queen of England.

- a. True
- b. False

33)  $|x| = 9$  if and only if  $x = -9$ .

- a. True
- b. False

Construct a truth table and select the correct *final* column.

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

a.

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

b.

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

c.

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

d.

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

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

a.

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

F	F	T	T
F	F	F	T

b.

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

c.

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

d.

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

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

36)  $(p \wedge q) \leftrightarrow (\sim p \vee \sim q)$

a.

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

b.

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

c.

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

F	T	F
F	F	T

d.

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