

Math 142

Test #1 Sample Problems

Spring 2024

Name: _____

Multiple Choice: Choose the answer that best fits as the solution to the question.

1. Use the variable A to represent Bob's age and use S to represent Bob's years of service in the military. It is required for members of the military to have a least a 20 years of service **and** be older than 45 years of age to be considered for a military pension. Use the variables to write the statement

“Bob is not eligible for the pension.”

- A) $(S < 20) \wedge (A \leq 45)$
 - B) $(S \geq 20) \vee (A \leq 45)$
 - C) $(S < 20) \vee (A \leq 45)$
 - D) $(S \leq 20) \wedge (A \leq 45)$
 - E) None of these
2. Given: c = Sam attended the concert.
 p = Sam attended the party.

Use symbolic logic to represent the sentence:

“Sam attended the concert, but not the party.”

- A) $(c \vee p)$
- B) $(c \wedge p)$
- C) $(c \wedge \neg p)$
- D) $(\neg c \wedge p)$
- E) None of these

3. Negate the statement: Some items were not on sale at Walmart.

- A) All items were not on sale at Walmart.
- B) Some items were on sale at Walmart.
- C) All items were on sale at Walmart.
- D) Not all items were on sale at Walmart.
- E) None of these.

4. Negate the statement: $(x > 12)$ and $(y \leq -13)$

- A) $(x > 12)$ or $(y \leq -13)$
- B) $\sim(x > 12)$ and $\sim(y \leq -13)$
- C) $(x < 12)$ and $(y > -13)$
- D) $(x \leq 12)$ and $(y \geq -13)$
- E) $(x \leq 12)$ or $(y > -13)$

Use the implication below for Questions 5 and 6

Given: If you finish your homework, then you do not have to do the dishes.

5. The inverse of the given statement is:

- A) If you do not finish your homework, then you do not have to do the dishes.
- B) If you do not have to do the dishes, then you finished your homework.
- C) If you do the dishes, then you do not have to finish your homework.
- D) If you do not finish your homework, then you have to do the dishes.
- E) None of these

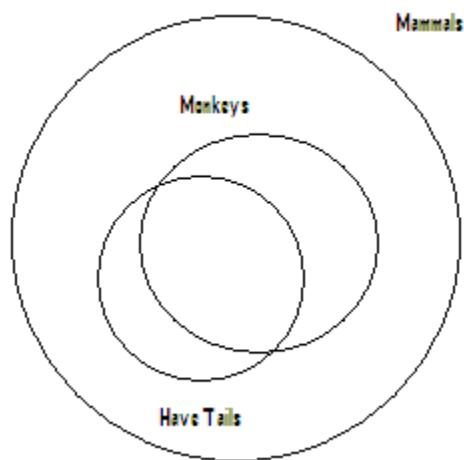
6. Identify the logically equivalent statement to the given implication.

- (A) If you do not finish your homework, then you do not have to do the dishes.
- B) If you do not have to do the dishes, then you finished your homework.
- C) If you do the dishes, then you do not finish your homework.
- D) If you do not finish your homework, then you have to do the dishes.
- E) None of these

7.. Using truth tables, $p \vee (\neg p \vee q)$ is a:

- A) Contradiction.
- B) Tautology.
- C) Neither a tautology or contradiction.

7. Given the Venn diagram below, which of the following statements are true?



- A) All monkeys are mammals
- B) All mammals are monkeys.
- C) Some monkeys do not have tails.
- D) Only A and C are true statements from the given diagram.
- E) A, B, and C are true statements from the diagram.

8. Knowing that p is false, q is false, and r is true, what is the truth value for:

$$\neg(p \rightarrow \neg r) \vee \neg q$$

- A) The statement is true.
- B) The statement is false.
- C) There is not enough information to determine whether the statement is true or false

9. Is the argument below valid or invalid?

The program is interesting or I will watch the basketball game.
The program is not interesting.
Therefore, I will watch the basketball game.

- A) The argument is valid.
- B) The argument is invalid.

10. Is the argument below valid or invalid?

If you go to the game, then you will have a great time.
You went to the game.
Therefore, you had a great time.

- A) The argument is valid by modus ponens.
- B) The argument is invalid by inverse fallacy.
- C) The argument is valid by modus tollens.
- D) The argument is invalid by converse fallacy.
- E) None of these

11. Given $T = \{-10, -6, 0, 4, 15\}$. Which of the following statements is true?

- i. $\forall x \in T, x \geq -10$
- ii. $\forall x \in T, x < 15$.
- iii. $\forall x \in T, x \geq -10 \vee x < -10$.

- A) All of the above are true.
- B) Only i and ii are true.
- C) Only i is true.
- D) None of these are true.
- E) Only i and iii are true.

12. Given $T = \{2, 4, 6, 8, 10, 12\}$ and the predicate $P(x)$ is “ $x > 2$ and x is odd”. Find the values $x \in T$ that are true for the negation of $P(x)$.

- A) 2, 4, 6
- B) 2
- C) 4, 6, 8, 10, 12
- D) None of the values of T is true.
- E) All of the values of T are true.

13. Let R be the set of Republican senators and let $O(x)$ be the predicate “ x are senators that support President Obama.” Write the *negation* of statement below using quantifiers.

Given statement: “All Republican senators do not support President Obama.”

- A) $\forall x \in R, O(x)$
 - B) $\forall x \in R, \neg O(x)$
 - C) $\exists x \in R, \neg O(x)$
 - D) $\exists x \in R, O(x)$
 - E) None of these
14. Identify the argument below as valid or invalid.

If you score a touchdown, then you will get \$20.
You did not score a touchdown.
Therefore, you did not score \$20.

- A) This argument is valid as a modus ponens argument.
 - B) The argument is valid as a modus tollens argument.
 - C) The argument is invalid because it is a converse fallacy.
 - D) The argument is invalid because it is an inverse fallacy.
15. Write the following implication as a universally quantified statement.

If x is a prime number, then it is divisible by 1.

- A) Some prime numbers are divisible by 1.
 - B) All prime numbers are not divisible by 1.
 - C) All prime numbers are divisible by 1.
 - D) No prime numbers are divisible by 1.
16. Which statement is logically equivalent to:

x is not an odd number and y is an even number.

- A) x is an even number or y is an odd number.
- B) x is an odd number and y is an odd number.
- C) x is an even number and y is an odd number.
- D) x is an even number or y is an odd number.
- E) None of these.

17. Given the set of statements below, determine if the logic displayed is deductive or inductive reasoning.

All x's are y's.
2 is an x.
Therefore, 2 is a y.

- A) Inductive Reasoning.
- B) Deductive Reasoning.
- C) Neither of these.

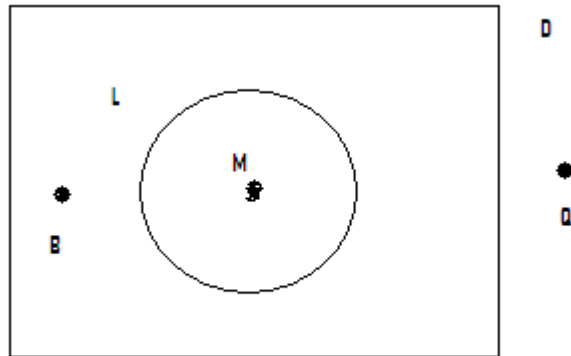
18. What would be the value of the truth table (last column) for $\neg(p \rightarrow \neg q) \vee \neg r$

- A) FFFFFFFF
- B) FTFFFFFF
- C) FTFFFFFF
- D) FTFFFFTT
- E) None of these

19. If p is given as any true statement, q is given as any false statement, and r is given as any true statement, what is the truth value of: $\neg(p \rightarrow \neg q) \wedge (\neg r \rightarrow p)$?

- A) True
- B) False
- C) Cannot tell from the information provided.

20. Given the following argument and Venn Diagram, what can be concluded?



Given: $\forall x \in L, D(x)$ where L is the set of dogs that liked to be walked on a leash and $D(x)$ is the predicate “the set of dogs.”

- A) M likes to be walked on a leash.
- B) B does not like to be walked on a leash, but is a dog.
- C) Q is not a dog.
- D) Some dogs do not like to be walked on a leash.
- E) All of these.