

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

Bob For Pension: $(S \geq 20) \wedge (A > 45)$

No Pension: $(S < 20) \vee (A \leq 45)$

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 $(y > -13)$

$$(x \leq 12) \vee (y > -13)$$

Use the implication below for Questions 5 and 6

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

P

$\sim Q$

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.

CONTRADICTORY!!

- (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

$$P \rightarrow \sim Q$$

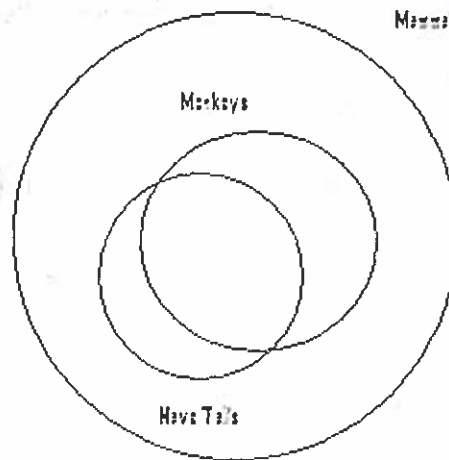
CONTRADICTORY: $Q \rightarrow \sim P$

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

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

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

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:

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

$$\sim (F \rightarrow F) \vee T$$

$$\sim T \vee T$$

- 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

$$F \vee T$$

T

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.

$$\frac{P \rightarrow Q \quad \sim P}{\therefore Q}$$

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

TRUTH TABLE: $[(P \rightarrow Q) \wedge \sim P] \rightarrow Q$

P	Q	$\sim P$
T	T	F
T	F	F
F	T	T
F	F	T

$(P \rightarrow Q)$	$[(P \rightarrow Q) \wedge \sim P]$	$[(P \rightarrow Q) \wedge \sim P] \rightarrow Q$
T	F	T
F	F	T
T	T	F
F	T	T

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

$$\frac{(P \rightarrow Q) \quad P}{P \quad Q} \quad \left. \vphantom{\frac{(P \rightarrow Q) \quad P}{P \quad Q}} \right\} \text{MODUS PONENS (NOTES)}$$

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.