

1. Which one of the following is not a statement?

- a) Today is Monday.
- b)  $1 + 1 = 2$  and  $5 > 3$ .
- c) Behave yourself and sit down.
- d) If Mike is a politician, then Jerry is a crook.

2. Let  $p$  represent the statement  $0 > 7$ , let  $q$  represent  $10 \leq 10$  and let  $r$  represent  $6 \leq 8$ . Which one of the following is **TRUE**?

- a)  $p \wedge q$
- b)  $p \vee q$
- c)  $(p \wedge r) \vee \sim q$
- d)  $p \wedge \sim p$

3. What is the negation of  $x < 6$ ?

- a)  $x > 6$
- b)  $x \geq 6$
- c)  $x \leq 6$
- d)  $6 > x$

4. Let  $j$  represent "John is present" and let  $s$  represent "Sarah is present." Convert the statement, "Sarah is present or John is absent" into symbols.

- a)  $s \vee j$
- b)  $s \wedge \sim j$
- c)  $j \vee \sim s$
- d)  $\sim j \vee s$

5. In the following truth table, find  $x$  and  $y$ .

$p$	$q$	$r$					$(p \wedge \sim q) \wedge \sim r$
T	T	T					
T	T	F					$x$
T	F	T					
T	F	F					$y$
F	T	T					
F	T	F					
F	F	T					
F	F	F					

- a)  $x = T, y = T$
- b)  $x = T, y = F$
- c)  $x = F, y = T$
- d)  $x = F, y = F$

6. Use De Morgan's laws to negate "It is not windy or I will wear a jacket."

- a) It is not windy and I will not wear a jacket.
- b) It is windy and I will not wear a jacket.
- c) It is windy or I will wear a jacket.
- d) It is windy or I will not wear a jacket.

7. Which one of the following statements is **FALSE**?

- a)  $p \vee T \equiv T$
- b)  $p \wedge F \equiv F$
- c)  $p \vee q \equiv q \vee p$
- d)  $p \rightarrow q \equiv \sim p \wedge q$

8. Which one of the following statements is equivalent to "If the book is over 200 pages, then I won't read it"?

- a) If the book is not over 200 pages, then I will read it.
- b) If I don't read the book, then the book is over 200 pages.
- c) The book is not over 200 pages, or I won't read it.
- d) The book is not over 200 pages, or I will read it.

9. If  $p$  is true, and  $q$  is false, what are the truth values of  $\sim p \rightarrow q$  and  $\sim q \rightarrow \sim p$  respectively?

- a) T and T.
- b) T and F.
- c) F and T.
- d) F and F.

10. What is the negation of statement "If I live in State College, then I live in the United States"?

- a) I live in State College and I don't live in United States.
- b) I don't live in State College or I live in United States.
- c) I don't live in State College and I don't live in United States.
- d) If I don't live in State College, then I don't live in United States.

11. Which one of the following statements is **NOT** equivalent to “If you are 18, then you can vote”?
- a) You can vote only if you are 18.
  - b) Being 18 is sufficient for you to vote.
  - c) Being 18 implies that you can vote.
  - d) You can vote when you are 18.
12. Which one of the following statements is **FALSE** for biconditional  $p \leftrightarrow q$ ?
- a)  $p \leftrightarrow q \equiv q \leftrightarrow p$ .
  - b)  $p \leftrightarrow q$  is true only if both  $p$  and  $q$  are true.
  - c)  $p \leftrightarrow q \equiv \sim p \leftrightarrow \sim q$ .
  - d)  $p \leftrightarrow q \equiv (p \rightarrow q) \wedge (q \rightarrow p)$ .
13. Which one of the following is **NOT** equivalent to the converse of statement “If I leave now, then I can catch the 2:00 PM flight”?
- a) I can catch the 2:00PM flight only if I leave now.
  - b) If I don’t leave now, I can’t catch the 2:00PM flight.
  - c) I can’t catch the 2:00PM flight, or I leave now.
  - d) I can’t catch the 2:00 PM flight only if I don’t leave now.
14. Decide whether the following argument is valid or invalid, and give the form (of valid or invalid argument) that applies.

If I am hungry, then I will eat.  
 I am not hungry.  


---

 I will not eat.

- a) Valid; Modus Tollens
  - b) Valid; Modus Ponens
  - c) Invalid; Fallacy of the Converse
  - d) Invalid; Fallacy of the Inverse
15. Decide whether the following argument is valid or invalid.

It will be hot or it will rain tomorrow.  
 It will rain tomorrow.  
 It will be hot tomorrow.  
 Suppose we know the following premises:  
 All classrooms have windows.  
 Some classrooms have an overhead projector.

- What conclusion can we draw?
- a) All classrooms have both windows and an overhead projector.
  - b) No classrooms with windows have an overhead projector.
  - c) Some classrooms have both windows and an overhead projector.
  - d) Cannot draw any conclusion from the premises.

16. Use the premises to give a conclusion that yields a valid argument: “If Adam is home, then Barb is not playing her guitar. If Chad is not in town, then Barb is playing her guitar. If Chad is in town, then Doug is bringing dinner home.”
- a) If Adam is home, then Doug is bringing dinner home.
  - b) If Adam is not home, then Chad is not in town.
  - c) If Barb is playing her guitar, then Doug is bringing dinner home.
  - d) If Doug is bringing dinner home, then Chad is in town.
17. Determine whether the following argument is valid or invalid, and which form is used.
- $$\frac{p \rightarrow \sim q}{\sim q} \quad p$$
- a) Valid; Modus ponens
  - b) Valid; Modus tollens
  - c) Invalid; Fallacy of the inverse
  - d) Invalid; Fallacy of the converse

18. Determine whether the argument is valid or invalid: If you live in Colorado, then you are near the mountains. If you live near the mountains, then you enjoy skiing. Therefore, if you do not enjoy skiing, you do not live in Colorado.
- a) Valid
  - b) Invalid
  - c) Neither
  - d) Cannot be determined

19. Give the negation of the statement  $\forall x[p(x) \rightarrow q(x)]$ .
- a)  $\exists x[\sim p(x) \wedge \sim q(x)]$
  - b)  $\exists x[p(x) \wedge q(x)]$
  - c)  $\forall x[p(x) \rightarrow \sim q(x)]$
  - d)  $\exists x[p(x) \rightarrow q(x)]$

1. C
2. B
3. B
4. D
5. C
6. B
7. D
8. C
9. B
10. A
11. A
12. B
13. D
14. D
15. B
16. A
17. D
18. A
19. A
20. C