

1. In the following table, find x and y .

| | | | | | | | |
|-----|-----|-----|--|--|--|--|-----------------------------------|
| p | q | r | | | | | $(\sim p) \wedge (q \vee \sim r)$ |
| T | T | T | | | | | |
| T | T | F | | | | | x |
| T | F | T | | | | | |
| T | F | F | | | | | |
| F | T | T | | | | | y |
| 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) $x = F, y = F$

2. Which of the following propositions is one of the associative properties?

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

3. Which one of the following is the inverse of the statement "If it is winter, it is a basketball season"?

- a) If it is not winter, it is not a basketball season.
- b) If it is a basketball season, it is winter.
- c) If it is not a basketball season, it is not winter.
- d) If it is spring, it is a baseball season.

4. Which of the following is not a tautology?

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

5. Which of the following is logically equivalent to $\sim p \implies \sim q$?

- a) $q \implies \sim p$
- b) $\sim q \implies p$
- c) $q \implies p$
- d) $\sim (p \implies \sim q)$

6. Which of the following is a proposition?

- a) Isn't this too easy?
- b) What an easy question!
- c) I know the answer for this question.
- d) Is this a trick question?

7. Which of the following is the negation of the statement "Some people have no cell phone"?

- a) Some people do not like cell phones.
- b) Everyone has more than one cell phone.
- c) Some people have more than one cell phone.
- d) Everyone has a cell phone.

8. Let p denote "Mike owns a car" and q denote "John does not own a car". Which of the following denotes "Neither Mike nor John owns a car"?

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

9. In the following table, find x and y .

| | | | | | | | |
|-----|-----|--|--|--|--|---------------------|-------------------|
| p | q | | | | | $\sim (p \wedge q)$ | $p \vee (\sim q)$ |
| T | T | | | | | | |
| T | F | | | | | | x |
| F | T | | | | | | |
| F | F | | | | | y | |

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

10. When it is raining, Sue studies. If she studies, she will not fail this course. Sue failed this course. What is the valid conclusion?
15. Which of the following represents the shaded region in the Venn diagram?

- | | |
|-------------------------------|--|
| a) Sue studied on rainy days. | a) $A \cup (\overline{B} \cap C)$ |
| b) It was raining. | b) $(A \cup C) \cap \overline{B}$ |
| c) Sue studied on sunny days. | c) $\overline{B} \cap (\overline{A} \cup C)$ |
| d) It was not raining. | d) $A \cap (B \cap C)$ |

11. Which of the following conclusions yields a valid argument given that the following premises are true?
16. Which one of the following is true for any sets A, B and C ?

$$\begin{aligned} \sim a &\implies \sim b \\ a &\implies c \end{aligned}$$

- | | |
|------------------------|---|
| a) $b \implies \sim b$ | a) $A \cap B = A \cup B$ |
| b) $\sim a \implies c$ | b) $\overline{A} \cap \overline{B} = A \cup B$ |
| c) $a \implies \sim c$ | c) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ |
| d) $b \implies c$ | d) $A \cup \phi = \phi$ |

17. For problems 17 and 18, consider the following Venn diagram:

12. Which of the following arguments is invalid?

- a) When it is a weekend, I do not study. I am studying. Therefore it is not a weekend.
- b) If Bill is a running back, then Andy is not a quarterback. If Andy is not a quarterback, then Joe is not a safety. Bill is a running back. Therefore Joe is not a safety.
- c) If Kate studies hard, she will pass with honors. If she passes with honors, she will get a well-paid job. Kate did not get a well-paid job. Therefore Kate did not study hard.
- d) If Smith is elected president, then Joe will be elected vice president. If Joe is elected vice president, then John will not be elected secretary. John is not elected secretary. So Smith is not elected president.

How many elements are in A but not in $B \cap C$?

13. If $A = \{1, 2, 3, 4\}$, $B = \{3, 4, 5, 6\}$ and the universal set $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$, then which one of the following is not true?

- | | |
|---|-------|
| a) $\overline{A} \cup \overline{B} \neq \phi$ | a) 20 |
| b) $\overline{A} \cap \overline{B} = \phi$ | b) 25 |
| c) $A \cap \overline{B} \neq \phi$ | c) 15 |
| d) $A \cap \overline{A} = \phi$ | d) 10 |

18. How many elements are in $A \cup (\overline{B} \cap C)$?

- | | |
|---|-------|
| 14. Which one of the following is the same set as the set $(A \cap \overline{B}) \cup (A \cap B)$? | a) 24 |
| a) $A \cup B$ | b) 29 |
| b) B | c) 35 |
| c) A | d) 40 |
| d) $A \cap B$ | |

19. If $C(A \cap B) = 3$, $C(A) = 10$ and $C(A \cup B) = 14$, then what is $C(B)$?

- a) 1
- b) 17
- c) 7
- d) 4

20. In a survey of 118 college students, it was found that

48 like soccer,

60 like football,

38 like tennis,

16 like soccer and football,

18 like soccer and tennis,

10 like tennis and football,

6 like all three sports.

How many like only tennis?

- a) 16
- b) 10
- c) 6
- d) 5