Mathematical Reasoning, Sets & Relations

Single Correct Answer Type

1. $\sim(p \vee q) \vee (\sim p \wedge q)$ is logically equivalent to

(A) $\sim p$ (B) p (C) q (D) $\sim q$

2. If the inverse of the implication $p \to q$ is defined as $\sim p \to \sim q$, then the inverse of the proposition $(p \wedge \sim q) \to r$ is

(A) $\sim r \to \sim p \vee q$ (B) $\sim p \vee q \to \sim r$ (C) $r \to p \wedge \sim q$ (D) None of these

3. Negation of the statement $p \to (q \wedge r)$ is

(A) $\sim p \to \sim (q \vee r)$ (B) $\sim p \to \sim (q \wedge r)$ (C) $(q \wedge r) \to p$ (D) $p \wedge (\sim q \vee \sim r)$

4. Which of the following is always true?

(A) $(p \to q) \cong (\sim q \to \sim p)$ (B) $\sim (p \vee q) \cong (\sim p \vee \sim q)$

(C) $\sim (p \to q) \cong (p \vee \sim q)$ (D) $\sim (p \wedge q) \cong (\sim p \wedge \sim q)$

5. The contrapositiive of $(p \vee q) \to r$ is

(A) $p \to (q \vee r)$ (B) $r \to (p \vee q)$ (C) $\sim r \to \sim (p \vee q)$ (D) $\sim r \to (\sim p \wedge \sim q)$

6. Which of the following statements is a tantology?

(A) $(\sim q \wedge p) \wedge q$ (B) $(\sim q \wedge p) \wedge (p \wedge \sim p)$ (C) $(\sim q \wedge p) \vee (p \vee \sim p)$ (D) $(p \wedge q) \vee (\sim (p \wedge q))$

7. In a college of 300 students, every student reads 5 news papers and every newspaper is read by 60 students. The number of newspapers is

(A) at least 30 (B) at most 20 (C) exactly 25 (D) none of these

8. Which of the following is $(A-B) \cup (B-A)$?

(A) $(A \cup B) - (A - B)$ (B) $(A \cup B) \cup (A \cap B)$ (C) $(A \cup B) - (A \cap B)$ (D) $(A - B) \cap (B - A)$

9. 20 teachers of a school either teach Mathematics or Physics. 12 of them teach Mathematics while 4 teach both subjects. The number of teachers teaching Physics only is

(A) 12 (B) 8 (C) 16 (D) None of these

10. The intersection of all the intervals having the form $\left[1+\frac{1}{n}, 6-\frac{2}{n}\right]$, where n is a positive integer is

(A) $[1,6]$ (B) $(1,6)$ (C) $[2,4]$ (D) $\left[\frac{3}{2}, 5\right]$

11. Each set X_r contains 5 elements and each set Y_r contains 2 elements and $\bigcup_{r=1}^{20} X_r = S = \bigcup_{r=1}^{n} Y_r$. If each element of S belong to exactly 10 of the $X_r's$ and to exactly 4 of the $Y_r's$, then n is

(A) 10 (B) 20 (C) 30 (D) 40

12. Two finite sets have m and n elements respectively. The total number of subsets of first set is 56 more than the total number of subsets of the second set. The values of m and n respectively are

(A) 7, 6 (B) 5, 1 (C) 6, 3 (D) 8, 7

13. Let $R = \{(1,3),(4,2),(2,4),(2,3),(3,1)\}$ be a relation on the set $A = \{1,2,3,4\}$. The relation R is

(A) reflexive (B) transitive (C) not symmetric (D) a function

14. If $A=\{2,5,7\}$, then the relation $R=\{(2,2),(2,5),(2,7),(5,5)\}$ is

(A) reflexive (B) symmetric (C) transitive (D) equivalence

15. The relation $R=\{(a,a),(a,c),(c,c),(c,a)\}$ on the set $A=\{a,b,c\}$ is

(A) reflexive, symmetric but not transitive (B) symmetric, transitive but not reflexive
(C) symmetric but not reflexive and transitive (D) None of these

16. If $A=\{2,4,6,8\}$, then $A\times A$ is

(A) only reflexive (B) only symmetric (C) only transitive (D) neither p and q

17. Consider the following statements

p : Every reflexive relation is symmetric

q : Every symmetric relation is transitive

Which among p and q is true?

(A) p alone (B) q alone (C) both p and q (D) p nor q

18. The relation '<' on the set of integers Z is

(A) only reflexive (B) only symmetric (C) only transitive (D) equivalence

19. If $n(A\times B)=36$, then which of the following is not a value that $n(A)$ can take?

(A) 2 (B) 4 (C) 8 (D) 36

20. The relation $R=\{(1,1),(2,2),(3,3)\}$ on the set $\{1,2,3\}$ is

(A) symmetric only (B) reflexive only
(C) an equivalence relation (D) transitive only

Numerical based

21. The relation on the set $A=\{x:|x|<3, x\in Z\}$ is defined by $R=\{(x,y):y=|x|, x\neq -1\}$. Then the number of elements in the power set of R is

22. Given the relation $R=\{(1,2),(2,3)\}$ on the set $A=\{1,2,3\}$, the minimum number of ordered pairs which when added to $\mathbb{R}$ make it an equivalence relation is

23. If $A=\{1,2,3,4\}$, then the number of subsets of set A containing element 3, is

24. If A and B are two sets containing 4 and 6 elements respectively, then the minimum number of elements in $A\cup B$ will be

25. In a class of 35 students, 17 have taken Mathematics, 10 have taken Mathematics but not Economics. If each student has taken either Mathematics or Economics or both, then the number of students who have taken Economics but not Mathematics is

KEY

1.	A	**2.**	B	**3.**	D	**4.**	A	**5.**	C
6.	C	**7.**	C	**8.**	C	**9.**	B	**10.**	B
11.	B	**12.**	C	**13.**	C	**14.**	C	**15.**	B
16.	D	**17.**	D	**18.**	C	**19.**	C	**20.**	C
21.	16	**22.**	7	**23.**	8	**24.**	6	**25.**	18

❈ *Wish You all the Best* ❈