EXERCISE-I

Sets

1. Given the sets $A=\{1,2,3\}, B=\{3,4\}$, $C = \{4, 5, 6\}$, then $A \cup (B \cap C)$ is
(A) {3} (B) {1, 2, 3, 4}
(C) {1, 2, 4, 5} (D) {1, 2, 3, 4, 5, 6}

2. If A and B are any two sets, then $A \cup (A \cap B)$ is equal to
(A) A (B) B
(C) A^c (D) B^c

3. If A and B are two given sets, then $A \cap (A \cap B)^c$ is equal to
(A) A (B) B
(C) φ (D) $A \cap B^c$

4. If the sets A and B are defined as
$A=\{(x,y): y=\frac{1}{x}, 0 \neq x \in R\}$ $\bigcup_{i=1}^{30} A_i = \bigcup_{j=1}^{n} B_j$, then
(A) $A \cap B = A$ (B) $A \cap B = B$
(C) $A \cap B = \varphi$ (D) None of these

5. Let $A=[x : x \in R, |x|<1]$; $B=[x : x \in R, |x-1| \geq 1]$ and $A \cup B = R - D$, then the set D is
(A) $[x : 1 < x \leq 2]$ (B) $[x : 1 \leq x < 2]$
(C) $[x : 1 \leq x \leq 2]$ (D) None of these

6. If the sets A and B are defined as $A=\{(x,y): y=e^x, x \in R\}$; $B=\{(x,y): y=x, x \in R\}$, then
(A) $B \subseteq A$ (B) $A \subseteq B$
(C) $A \cap B = \varphi$ (D) $A \cup B = A$

7. If $X=\{4^n - 3n - 1 : n \in N\}$ and $Y=\{9(n-1) : n \in N\}$, then $X \cup Y$ is equal to
(A) X (B) Y
(C) N (D) None of these

8. Let $n(U)=700, n(A)=200, n(B)=300$ and $n(A \cap B)=100$, then $n(A^c \cap B^c) =$
(A) 400 (B) 600
(C) 300 (D) 200

9. In a town of 10,000 families it was found that 40% family buy newspaper A, 20% buy newspaper B and 10% families buy newspaper C, 5% families buy A and B, 3% buy B and C and 4% buy A and C. If 2% families buy all the three newspapers, then number of families which buy A only is
(A) 3100 (B) 3300
(C) 2900 (D) 1400

10. In a city 20 percent of the population travels by car, 50 percent travels by bus and 10 percent travels by both car and bus. Then persons travelling by car or bus is
(A) 80 percent (B) 40 percent
(C) 60 percent (D) 70 percent

11. If $Q=\left\{x : x=\frac{1}{y}, \text{where } y \in N\right\}$, then
(A) $0 \in Q$ (B) $1 \in Q$
(C) $2 \in Q$ (D) $\frac{2}{3} \in Q$

12. Which set is the subset of all given sets
(A) {1, 2, 3, 4,......} (B) {1}
(C) {0} (D) {}

13. Let $S=\{0,1,5,4,7\}$. Then the total number of subsets of S is
(A) 64 (B) 32
(C) 40 (D) 20

14. The number of non-empty subsets of the set {1, 2, 3, 4} is
(A) 15 (B) 14
(C) 16 (D) 17

15. The smallest set A such that $A \cup \{1, 2\} = \{1, 2, 3, 5, 9\}$ is
(A) {2, 3, 5} (B) {3, 5, 9}
(C) {1, 2, 5, 9} (D) None of these

16. If $A \cap B = B$, then
(A) $A \subset B$ (B) $B \subset A$
(C) $A = \varphi$ (D) $B = \varphi$

17. If A and B are two sets, then $A \cup B = A \cap B$ if
(A) $A \subseteq B$ (B) $B \subseteq A$
(C) $A = B$ (D) None of these

18. Let A and B be two sets. Then
(A) $A \cup B \subseteq A \cap B$ (B) $A \cap B \subseteq A \cup B$
(C) $A \cap B = A \cup B$ (D) None of these

19. Let $A = \{(x, y) : y = e^x, x \in R\}$,
$B = \{(x, y) : y = e^{-x}, x \in R\}$. Then
(A) $A \cap B = \varphi$ (B) $A \cap B \neq \varphi$
(C) $A \cup B = R^2$ (D) None of these

20. If $A = \{2, 3, 4, 8, 10\}$, $B = \{3, 4, 5, 10, 12\}$, $C = \{4, 5, 6, 12, 14\}$ then $(A \cap B) \cup (A \cap C)$ is equal to
(A) $\{3, 4, 10\}$ (B) $\{2, 8, 10\}$
(C) $\{4, 5, 6\}$ (D) $\{3, 5, 14\}$

21. If A and B are two sets then $(A - B) \cup (B - A) \cup (A \cap B)$ is equal to
(A) $A \cup B$ (B) $A \cap B$
(C) A (D) B'

22. Let A and B be two sets then $(A \cup B)' \cup (A' \cap B)$ is equal to
(A) A' (B) A
(C) B' (D) None of these

23. Let U be the universal set and $A \cup B \cup C = U$. Then $\{(A - B) \cup (B - C) \cup (C - A)\}'$ is equal to
(A) $A \cup B \cup C$ (B) $A \cup (B \cap C)$
(C) $A \cap B \cap C$ (D) $A \cap (B \cup C)$

24. If $n(A) = 3$, $n(B) = 6$ and $A \subseteq B$. Then the number of elements in $A \cup B$ is equal to
(A) 3 (B) 9
(C) 6 (D) None of these

25. Let A and B be two sets such that $n(A) = 0.16, n(B) = 0.14, n(A \cup B) = 0.25$. Then $n(A \cap B)$ is equal to
(A) 0.3 (B) 0.5
(C) 0.05 (D) None of these

26. If A and B are disjoint, then $n(A \cup B)$ is equal to
(A) $n(A)$ (B) $n(B)$
(C) $n(A) + n(B)$ (D) $n(A) . n(B)$

27. If A and B are not disjoint sets, then $n(A \cup B)$ is equal to
(A) $n(A) + n(B)$ (B) $n(A) + n(B) - n(A \cap B)$
(C) $n(A) + n(B) + n(A \cap B)$ (D) $n(A)\,n(B)$

28. In a battle 70% of the combatants lost one eye, 80% an ear, 75% an arm, 85% a leg, x% lost all the four limbs. The minimum value of x is
(A) 10 (B) 12
(C) 15 (D) None of these

29. Out of 800 boys in a school, 224 played cricket, 240 played hockey and 336 played basketball. Of the total, 64 played both basketball and hockey; 80 played cricket and basketball and 40 played cricket and hockey; 24 played all the three games. The number of boys who did not play any game is
(A) 128 (B) 216
(C) 240 (D) 160

30. A survey shows that 63% of the Americans like cheese whereas 76% like apples. If x% of the Americans like both cheese and apples, then
(A) $x = 39$ (B) $x = 63$
(C) $39 \leq x \leq 63$ (D) None of these

31. 20 teachers of a school either teach mathematics or physics. 12 of them teach mathematics while 4 teach both the subjects. Then the number of teachers teaching physics only is
(A) 12 (B) 8
(C) 16 (D) None of these

32. Of the members of three athletic teams in a school 21 are in the cricket team, 26 are in the hockey team and 29 are in the football team. Among them, 14 play hockey and cricket, 15 play hockey and football, and 12 play football and cricket. Eight play all the three games. The total number of members in the three athletic teams is
(A) 43 (B) 76
(C) 49 (D) None of these

33. In a class of 100 students, 55 students have passed in Mathematics and 67 students have passed in Physics. Then the number of students who have passed in Physics only is

(A) 22 (B) 33
(C) 10 (D) 45

34. If A and B are two sets, then $A \times B = B \times A$ if

(A) $A \subseteq B$ (B) $B \subseteq A$
(C) $A = B$ (D) None of these

35. If A and B be any two sets, then $(A \cap B)'$ is equal to

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

36. If (1, 3), (2, 5) and (3, 3) are three elements of $A \times B$ and the total number of elements in $A \times B$ is 6, then the remaining elements of $A \times B$ are

(A) (1, 5); (2, 3); (3, 5)
(B) (5, 1);(3, 2);(5, 3)
(C) (1, 5); (2, 3); (5, 3)
(D) None of these

37. $A = \{1, 2, 3\}$ and $B = \{3, 8\}$, then $(A \cup B) \times (A \cap B)$ is

(A) {(3, 1), (3, 2), (3, 3), (3, 8)}
(B) {(1, 3), (2, 3), (3, 3), (8, 3)}
(C) {(1, 2), (2, 2), (3, 3), (8, 8)}
(D) {(8, 3), (8, 2), (8, 1), (8, 8)}

38. If $A = \{2, 3, 5\}$, $B = \{2, 5, 6\}$, then $(A - B) \times (A \cap B)$ is

(A) {(3, 2), (3, 3), (3, 5)}
(B) {(3, 2), (3, 5), (3, 6)}
(C) {(3, 2), (3, 5)}
(D) None of these

39. In a class of 30 pupils, 12 take needle work, 16 take physics and 18 take history. If all the 30 students take at least one subject and no one takes all three then the number of pupils taking 2 subjects is

(A) 16 (B) 6
(C) 8 (D) 20

40. The number of elements in the set $\{(a,b) : 2a^2 + 3b^2 = 35, a, b \in Z\}$, where Z is the set of all integers, is

(A) 2 (B) 4
(C) 8 (D) 12

41. If $A = \{1, 2, 3, 4\}$; $B = \{a, b\}$ and f is a mapping such that $f : A \to B$, then $A \times B$ is

(A) {(a, 1), (3, b)}
(B) {(a, 2), (4, b)}
(C) {(1, a), (1, b), (2, a), (2, b), (3, a), (3, b), (4, a), (4, b)}
(D) None of these

42. If $A = \{1, 2, 3, 4, 5\}$, $B = \{2, 4, 6\}$, $C = \{3, 4, 6\}$, then $(A \cup B) \cap C$ is

(A) {3, 4, 6} (B) {1, 2, 3}
(C) {1, 4, 3} (D) None of these

43. If $A = \{x, y\}$ then the power set of A is

(A) $\{x^x, y^y\}$
(B) $\{\phi, x, y\}$
(C) $\{\phi, \{x\}, \{2y\}\}$
(D) $\{\phi, \{x\}, \{y\}, \{x, y\}\}$

44. A set contains $2n+1$ elements. The number of subsets of this set containing more than n elements is equal to

(A) 2^{n-1} (B) 2^n
(C) 2^{n+1} (D) 2^{2n}

45. Which of the following is a true statement

(A) $\{a\} \in \{a, b, c\}$ (B) $\{a\} \subseteq \{a, b, c\}$
(C) $\phi \in \{a, b, c\}$ (D) None of these

46. If $A = \{x : x$ is a multiple of $4\}$ and $B = \{x : x$ is a multiple of $6\}$ then $A \subset B$ consists of all multiples of

(A) 16 (B) 12
(C) 8 (D) 4

47. A class has 175 students. The following data shows the number of students obtaining one or more subjects. Mathematics 100, Physics 70, Chemistry 40; Mathematics and Physics 30, Mathematics and Chemistry 28, Physics and Chemistry 23; Mathematics, Physics and Chemistry 18. How many students have offered Mathematics alone

(A) 35 (B) 48
(C) 60 (D) 22

48. Consider the following relations :

(1) $A-B=A-(A\cap B)$

(2) $A=(A\cap B)\cup(A-B)$

(3) $A-(B\cup C)=(A-B)\cup(A-C)$

which of these is/are correct

(A) 1 and 3 (B) 2 only
(C) 2 and 3 (D) 1 and 2

49. If two sets A and B are having 99 elements in common, then the number of elements common to each of the sets $A\times B$ and $B\times A$ are

(A) 2^{99} (B) 99^2
(C) 100 (D) 18

50. Given $n(U)=20$, $n(A)=12$, $n(B)=9$, $n(A\cap B)=4$, where U is the universal set, A and B are subsets of U, then $n((A\cup B)^C)=$

(A) 17 (B) 9
(C) 11 (D) 3

Relations

51. Let X be a family of sets and R be a relation on X defined by 'A is disjoint from B'. Then R is

(A) Reflexive (B) Symmetric
(C) Anti-symmetric (D) Transitive

52. If R is a relation from a set A to a set B and S is a relation from B to a set C, then the relation SoR

(A) Is from A to C (B) Is from C to A
(C) Does not exist (D) None of these

53. If $R\subset A\times B$ and $S\subset B\times C$ be two relations, then $(SoR)^{-1}=$

(A) $S^{-1}oR^{-1}$ (B) $R^{-1}oS^{-1}$
(C) SoR (D) RoS

54. If R be a relation < from A = {1,2, 3, 4} to B = {1, 3, 5} *i.e.,* $(a,b)\in R\Leftrightarrow a<b$, then RoR^{-1} is

(A) {(1, 3), (1, 5), (2, 3), (2, 5), (3, 5), (4, 5)}
(B) {(3, 1) (5, 1), (3, 2), (5, 2), (5, 3), (5, 4)}
(C) {(3, 3), (3, 5), (5, 3), (5, 5)}
(D) {(3, 3) (3, 4), (4, 5)}

55. A relation from P to Q is

(A) A universal set of $P \times Q$
(B) $P \times Q$
(C) An equivalent set of $P \times Q$
(D) A subset of $P \times Q$

56. Let A = {a, b, c} and B = {1, 2}. Consider a relation R defined from set A to set B. Then R is equal to set

(A) A (B) B
(C) $A \times B$ (D) $B \times A$

57. Let n(A) = n. Then the number of all relations on A is

(A) 2^n (B) $2^{(n)!}$
(C) 2^{n^2} (D) None of these

58. If R is a relation from a finite set A having m elements to a finite set B having n elements, then the number of relations from A to B is

(A) 2^{mn} (B) $2^{mn}-1$
(C) $2mn$ (D) m^n

59. Let R be a reflexive relation on a finite set A having n-elements, and let there be m ordered pairs in R. Then

(A) $m\ge n$ (B) $m\le n$
(C) $m=n$ (D) None of these

60. The relation R defined on the set A = {1, 2, 3, 4, 5} by

$R=\{(x,y):|x^2-y^2|<16\}$ is given by

(A) {(1, 1), (2, 1), (3, 1), (4, 1), (2, 3)}
(B) {(2, 2), (3, 2), (4, 2), (2, 4)}
(C) {(3, 3), (3, 4), (5, 4), (4, 3), (3, 1)}
(D) None of these

61. A relation R is defined from {2, 3, 4, 5} to {3, 6, 7, 10} by $xRy \Leftrightarrow x$ is relatively prime to y. Then domain of R is

(A) {2, 3, 5} (B) {3, 5}
(C) {2, 3, 4} (D) {2, 3, 4, 5}

62. Let R be a relation on N defined by $x+2y=8$. The domain of R is

(A) {2, 4, 8} (B) {2, 4, 6, 8}
(C) {2, 4, 6} (D) {1, 2, 3, 4}

63. If $R=\{(x,y) \mid x,y \in Z, x^2+y^2 \le 4\}$ is a relation in Z, then domain of R is

(A) {0, 1, 2} (B) {0, – 1, – 2}
(C) {– 2, – 1, 0, 1, 2} (D) None of these

64. R is a relation from {11, 12, 13} to {8, 10, 12} defined by $y=x-3$. Then R^{-1} is

(A) {(8, 11), (10, 13)} (B) {(11, 18), (13, 10)}
(C) {(10, 13), (8, 11)} (D) None of these

65. Let A = {1, 2, 3}, B = {1, 3, 5}. If relation R from A to B is given by R ={(1, 3), (2, 5), (3, 3)}. Then R^{-1} is

(A) {(3, 3), (3, 1), (5, 2)} (B) {(1, 3), (2, 5), (3, 3)}
(C) {(1, 3), (5, 2)} (D) None of these

66. Let A = {1, 2, 3, 4} and let R= {(2, 2), (3, 3), (4, 4), (1, 2)} be a relation on A. Then R is

(A) Reflexive (B) Symmetric
(C) Transitive (D) None of these

67. The void relation on a set A is

(A) Reflexive
(B) Symmetric and transitive
(C) Reflexive and symmetric
(D) Reflexive and transitive

68. Let R_1 be a relation defined by

$R_1=\{(a,b) \mid a \ge b, a,b \in R\}$. Then R_1 is

(A) An equivalence relation on R
(B) Reflexive, transitive but not symmetric
(C) Symmetric, Transitive but not reflexive
(D) Neither transitive not reflexive but symmetric

69. Which one of the following relations on R is an equivalence relation

(A) $a R_1 b \Leftrightarrow |a|=|b|$ (B) $aR_2b \Leftrightarrow a \ge b$
(C) $aR_3b \Leftrightarrow a$ divides b (D) $aR_4b \Leftrightarrow a<b$

70. If R is an equivalence relation on a set A, then R^{-1} is

(A) Reflexive only
(B) Symmetric but not transitive
(C) Equivalence
(D) None of these

71. R is a relation over the set of real numbers and it is given by $nm \ge 0$. Then R is

(A) Symmetric and transitive
(B) Reflexive and symmetric
(C) A partial order relation
(D) An equivalence relation

72. In order that a relation R defined on a non-empty set A is an equivalence relation, it is sufficient, if R

(A) Is reflexive
(B) Is symmetric
(C) Is transitive
(D) Possesses all the above three properties

73. The relation "congruence modulo m" is

(A) Reflexive only
(B) Transitive only
(C) Symmetric only
(D) An equivalence relation

74. Solution set of $x \equiv 3 \pmod 7$, $p \in Z$, is given by

(A) {3} (B) $\{7p-3 : p \in Z\}$
(C) $\{7p+3 : p \in Z\}$ (D) None of these

75. Let R and S be two equivalence relations on a set A. Then

(A) $R \cup S$ is an equivalence relation on A
(B) $R \cap S$ is an equivalence relation on A
(C) $R-S$ is an equivalence relation on A
(D) None of these

76. Let R={(3,3), (6, 6), (9,9), (12,12), (6,12), (3,9), (3,12), (3,6)} be a relation on the set $A=\{3,6,9,12\}$. The relation is

(A) An equivalence relation
(B) Reflexive and symmetric only
(C) Reflexive and transitive only
(D) Reflexive only

77. $x^2 = xy$ is a relation which is

(A) Symmetric (B) Reflexive

(C) Transitive (D) None of these

78. 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

79. The number of reflexive relations of a set with four elements is equal to

(A) 2^{16} (B) 2^{12}

(C) 2^{8} (D) 2^{4}

80. Let S be the set of all real numbers. Then the relation $R = \{(a, b) : 1 + ab > 0\}$ on S is

(A) Reflexive and symmetric but not transitive

(B) Reflexive and transitive but not symmetric

(C) Symmetric, transitive but not reflexive

(D) Reflexive, transitive and symmetric