# Ordinary Thinking

## Objective Questions

### Set theory

**1.** The set of intelligent students in a class is **[AMU 199**
(a) A null set
(b) A singleton set
(c) A finite set
(d) Not a well defined collection

**2.** Which of the following is the empty set **[Karnataka CET 1990]**
(a) $\{x : x$ is a real number and $x^2 - 1 = 0\}$
(b) $\{x : x$ is a real number and $x^2 + 1 = 0\}$
(c) $\{x : x$ is a real number and $x^2 - 9 = 0\}$
(d) $\{x : x$ is a real number and $x^2 = x + 2\}$

**3.** The set $A = \{x : x \in R, x^2 = 16$ and $2x = 6\}$ equals **[Karnataka CET 1995]**
(a) $\phi$ (b) $\{14, 3, 4\}$
(c) $\{3\}$ (d) $\{4\}$

**4.** If a set $A$ has $n$ elements, then the total number of subsets of $A$ is **[Roorkee 1991; Karnataka CET 199**
(a) $n$ (b) $n^2$
(c) $2^n$ (d) $2n$

**5.** The number of proper subsets of the set {1, 2, 3} is **[JMIEE 2000]**
(a) 8 (b) 7
(c) 6 (d) 5

**6.** Given the sets $A = \{1, 2, 3\}, B = \{3, 4\}$, $C = \{4, 5, 6\}$, then $A \cup (B \cap C)$ is **[MNR 1988; Kurukshetra CEE 19**
(a) {3} (b) {1, 2, 3, 4}
(c) {1, 2, 4, 5} (d) {1, 2, 3, 4, 5, 6}

**7.** If $A$ and $B$ are any two sets, then $A \cup (A \cap B)$ is equal to **[Karnataka CET 1996]**
(a) $A$ (b) $B$
(c) $A^c$ (d) $B^c$

**8.** If $A$ and $B$ are two given sets, then $A \cap (A \cap B)^c$ is equal to **[AMU 1998; Kurukshetra CEE 1999]**
(a) A (b) B
(c) $\phi$ (d) $A \cap B^c$

**9.** If the sets $A$ and $B$ are defined as
$A = \{(x, y) : y = \frac{1}{x}, 0 \neq x \in R\}$
$B = \{(x, y) : y = -x, x \in R\}$, then
(a) $A \cap B = A$ (b) $A \cap B = B$
(c) $A \cap B = \phi$ (d) None of these

**10.** 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

**11.** 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 **[UPSEA**
(a) $B \subseteq A$ (b) $A \subseteq B$
(c) $A \cap B = \phi$ (d) $A \cup B = A$

**12.** If $X = \{4^n - 3n - 1 : n \in N\}$ and $Y = \{9(n-1) : n \in N\}$, then $X \cup Y$ is equal to **[Karnataka CET 1997]**
(a) $X$ (b) $Y$
(c) $N$ (d) None of these

**13.** 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

**14.** 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 **[Roorkee 1997]**
(a) 3100 (b) 3300
(c) 2900 (d) 1400

**15.** 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 **[Kerala (Engg.) 2002]**
(a) 80 percent (b) 40 percent
(c) 60 percent (d) 70 percent

**16.** In a class of 55 students, the number of students studying different subjects are 23 in Mathematics, 24 in Physics, 19 in Chemistry, 12 in Mathematics and Physics, 9 in Mathematics and Chemistry, 7 in Physics and Chemistry and 4 in all the three subjects. The number of students who have taken exactly one subject is **[UPSEAT 1990]**
(a) 6 (b) 9
(c) 7 (d) All of these

**17.** If $A$, $B$ and $C$ are any three sets, then $A \times (B \quad C)$ is equal to
(a) $(A \times B) \quad (A \times C)$ (b) $(A \quad B) \times (A \quad C)$
(c) $(A \times B) \quad (A \times C)$ (d) None of these

**18.** If $A$, $B$ and $C$ are any three sets, then $A - (B \quad C)$ is equal to
(a) $(A - B) \quad (A - C)$ (b) $(A - B) \quad (A - C)$
(c) $(A - B) \quad C$ (d) $(A - B) \quad C$

**19.** If $A$, $B$ and $C$ are non-empty sets, then $(A - B)$ $(B - A)$ equals **[AMU 1992, 1998; DCE 1998]**
(a) $(A \quad B) - B$ (b) $A - (A \quad B)$

(c) $(A \quad B) - (A \quad B)$ (d) $(A \quad B) \quad (A \quad B)$

**20.** If $A = \{2, 4, 5\}$, $B = \{7, 8, 9\}$, then $n(A \times B)$ is equal to

(a) 6 (b) 9

(c) 3 (d) 0

**21.** If the set $A$ has $p$ elements, $B$ has $q$ elements, then the number of elements in $A \times B$ is

(a) $p+q$ (b) $p+q+1$

(c) $pq$ (d) $p^2$

**22.** If $A = \{a, b\}, B = \{c, d\}, C = \{d, e\}$, then $\{(a,c),(a,d),(a,e),(b,c),(b,d),(b,e)\}$ is equal to **[AMU 1999; Him. CET 2002]**

(a) $A \quad (B \quad C)$ (b) $A \quad (B \quad C)$

(c) $A \times (B \quad C)$ (d) $A \times (B \quad C)$

**23.** If $P$, $Q$ and $R$ are subsets of a set $A$, then $R \times (P^c \quad Q^c)^c =$ **[Karnataka CET 1993]**

(a) $(R \times P) \quad (R \times Q)$ (b) $(R \times Q) \cap (R \times P)$

(c) $(R \times P) \cup (R \times Q)$ (d) None of these

**24.** In rule method the null set is represented by **[Karnataka CET 1998]**

(a) { } (b) $\phi$

(c) $\{x : x = x\}$ (d) $\{x : x \neq x\}$

**25.** $A = \{x : x \neq x\}$ represents **[Kurukshetra CEE 1998]**

(a) {0} (b) { }

(c) {1} (d) $\{x\}$

**26.** 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) $\frac{2}{3} \in Q$

**27.** Which set is the subset of all given sets

(a) {1, 2, 3, 4,……} (b) {1}

(c) {0} (d) { }

**28.** Let $S = \{0, 1, 5, 4, 7\}$. Then the total number of subsets of $S$ is

(a) 64 (b) 32

(c) 40 (d) 20

**29.** The number of non-empty subsets of the set {1, 2, 3, 4} is **[Karnataka CET 1997; AMU 1998]**

(a) 15 (b) 14

(c) 16 (d) 17

**30.** The smallest set $A$ such that $A \quad \{1, 2\} = \{1, 2, 3, 5, 9\}$ is

(a) {2, 3, 5} (b) {3, 5, 9}

(c) {1, 2, 5, 9} (d) None of these

**31.** If $A \quad B = B$, then **[JMIEE 2000]**

(a) $A \subset B$ (b) $B \subset A$

(c) $A = \phi$ (d) $B = \phi$

**32.** If $A$ and $B$ are two sets, then $A \cup B = A \cap B$ iff

(a) $A \subseteq B$ (b) $B \subseteq A$

(c) $A = B$ (d) None of these

**33.** Let $A$ and $B$ be two sets. Then

(a) $A \quad B \subseteq A \quad B$ (b) $A \quad B \subseteq A \quad B$

(c) $A \quad B = A \quad B$ (d) None of these

**34.** Let $A = \{(x, y) : y = e^x, x \in R\}$, $B = \{(x, y) : y = e^{-x}, x \in R\}$. Then

(a) $A \cap B = \phi$ (b) $A \cap B \neq \phi$

(c) $A \cup B = R^2$ (d) None of these

**35.** If $A = \{2, 3, 4, 8, 10\}$, $B = \{3, 4, 5, 10, 12\}$, $C = \{4, 5, 6, 12, 14\}$ then $(A \quad B) \quad (A \quad C)$ is equal to

(a) {3, 4, 10} (b) {2, 8, 10}

(c) {4, 5, 6} (d) {3, 5, 14}

**36.** If $A$ and $B$ are any two sets, then $A \quad (A \quad B)$ is equal to

(a) $A$ (b) $B$

(c) $A^c$ (d) $B^c$

**37.** If $A$, $B$, $C$ be three sets such that $A \quad B = A \quad C$ and $A \quad B = A \quad C$, then

(a) $A = B$ (b) $B = C$

(c) $A = C$ (d) $A = B = C$

**38.** Let $A = \{a, b, c\}$, $B = \{b, c, d\}$, $C = \{a, b, d, e\}$, then $A \quad (B \quad C)$ is **[Kurukshetra CEE 1997]**

(a) $\{a, b, c\}$ (b) $\{b, c, d\}$

(c) $\{a, b, d, e\}$ (d) $\{e\}$

**39.** If $A$ and $B$ are sets, then $A \quad (B - A)$ is

(a) $\phi$ (b) $A$

(c) $B$ (d) None of these

**40.** If $A$ and $B$ are two sets, then $A \cap (A \cup B)'$ is equal to

(a) $A$ (b) $B$

(c) $\phi$ (d) None of these

**41.** Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, $A = \{1, 2, 5\}, B = \{6, 7\}$, then $A \cap B'$ is

(a) $B'$ (b) $A$

(c) $A'$ (d) $B$

**42.** If $A$ is any set, then

(a) $A \cup A' = \phi$ (b) $A \cup A' = U$

(c) $A \cap A' = U$ (d) None of these

**43.** If $N_a = [an : n \in N\}$, then $N_5 \cap N_7 =$ **[Kerala (Engg.) 2005]**

(a) $N_7$ (b) $N$

(c) $N_{35}$ (d) $N_5$

(e) $N_{12}$

**44.** If $aN = \{ax : x \in N\}$, then the set $3N \cap 7N$ is

(a) 21 $N$ (b) 10 $N$

(c) 4 $N$ (d) None of these

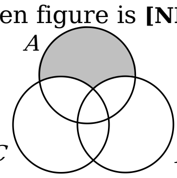
**45.** The shaded region in the given figure is **[NDA 2000]**

(a) $A \quad (B \quad C)$

(b) $A \quad (B \quad C)$

(c) $A \quad (B - C)$

(d) $A - (B \quad C)$




**46.** If $A$ and $B$ are two sets then $(A - B) \quad (B - A) \quad (A \quad B)$ is equal to

(a) $A \quad B$ (b) $A \quad B$
(c) $A$ (d) $B'$

**47.** 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

**48.** 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) $A \cap (B \cup C)$

**49.** 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

**50.** 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 **[JMIEE 2001]**
(a) 0.3 (b) 0.5
(c) 0.05 (d) None of these

**51.** 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) $n(A).n(B)$

**52.** If $A$ and $B$ are not disjoint sets, then $n(A \cup B)$ is equal to
**[Kerala (Engg.) 2001]**
(a) $n(A) + n(B)$ (b) $n(A) + n(B) - n(A \cap B)$
(c) $n(A) + n(B) + n(A \cap B)$ (d) $n(A) n(B)$
(e) $n(A) - n(B)$

**53.** 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

**54.** 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 **[DCE 1995; MP PET 1996]**
(a) 128 (b) 216
(c) 240 (d) 160

**55.** 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) $39 \le x \le 63$ (d) None of these

**56.** 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

**57.** 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

**58.** 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
**[DCE 1993; ISM Dhanbad 1994]**
(a) 22 (b) 33
(c) 10 (d) 45

**59.** If $A$ and $B$ are two sets, then $A \times B = B \times A$ iff
(a) $A \subseteq B$ (b) $B \subseteq A$
(c) $A = B$ (d) None of these

**60.** 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) $A \cup B$

**61.** Let $A$ and $B$ be subsets of a set $X$. Then
(a) $A - B = A \cup B$ (b) $A - B = A \cap B$
(c) $A - B = A^c \cap B$ (d) $A - B = A \cap B^c$

**62.** Let $A$ and $B$ be two sets in the universal set. Then $A - B$ equals
(a) $A \cap B^c$ (b) $A^c \cap B$
(c) $A \cap B$ (d) None of these

**63.** If $A$, $B$ and $C$ are any three sets, then $A - (B \cap C)$ is equal to
(a) $(A - B) \cup (A - C)$ (b) $(A - B) \cap (A - C)$
(c) $(A - B) \cup C$ (d) $(A - B) \cap C$

**64.** If $A$, $B$, $C$ are three sets, then $A \quad (B \quad C)$ is equal to
(a) $(A \quad B) \quad (A \quad C)$ (b) $(A \quad B) \quad (A \quad C)$
(c) $(A \quad B) \quad (A \quad C)$ (d) None of these

**65.** If $A = \{1, 2, 4\}$, $B = \{2, 4, 5\}$, $C = \{2, 5\}$, then $(A - B) \times (B - C)$ is
(a) $\{(1, 2), (1, 5), (2, 5)\}$ (b) $\{(1, 4)\}$
(c) $(1, 4)$ (d) None of these

**66.** 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

**67.** $A = \{1, 2, 3\}$ and $B = \{3, 8\}$, then $(A \quad B) \times (A \quad B)$ 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)}

**68.** If $A = \{2, 3, 5\}$, $B = \{2, 5, 6\}$, then $(A - B) \times (A \quad B)$ is
(a) {(3, 2), (3, 3), (3, 5)} (b) {(3, 2), (3, 5), (3, 6)}
(c) {(3, 2), (3, 5)} (d) None of these

**69.** 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 **[J & K 2005]**
(a) 16 (b) 6
(c) 8 (d) 20

**70.** If $n(A) = 4$, $n(B) = 3$, $n(A \times B \times C) = 24$, then $n(C) =$ **[Kerala (Engg.) 2005]**
(a) 288 (b) 1
(c) 12 (d) 17
(e) 2

**71.** 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 **[Kerala (Engg.) 2005]**
(a) 2 (b) 4
(c) 8 (d) 12
(e) 16

**72.** 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

**73.** If $A = \{1, 2, 3, 4, 5\}$, $B = \{2, 4, 6\}$, $C = \{3, 4, 6\}$, then $(A \cup B) \cap C$ is **[Orissa JEE 2004]**
(a) {3, 4, 6} (b) {1, 2, 3}
(c) {1, 4, 3} (d) None of these

**74.** If $A = \{x, y\}$ then the power set of $A$ is **[Pb. CET 2004, UPSEAT 2000]**
(a) $\{x^x, y^y\}$
(b) { , *x*, *y*}
(c) { , {*x*}, {2*y*}}
(d) { , {*x*}, {*y*}, {*x*, *y*}}

**75.** A set contains $2n+1$ elements. The number of subsets of this set containing more than $n$ elements is equal to **[UPSEAT 2001, 04]**
(a) $2^{n-1}$ (b) $2^n$
(c) $2^{n+1}$ (d) $2^{2n}$

**76.** Which of the following is a true statement **[UPSEAT 2**
(a) {*a*} {*a*, *b*, *c*} (b) {*a*} {*a*, *b*, *c*}
(c) {*a*, *b*, *c*} (d) None of these

**77.** If $A = \{x : x$ is a multiple of 4} and $B = \{x : x$ is a multiple of 6} then $A \quad B$ consists of all multiples of **[UPSEAT 2000]**
(a) 16 (b) 12
(c) 8 (d) 4

**78.** 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 **[Kerala (Engg.) 2003]**
(a) 35 (b) 48
(c) 60 (d) 22
(e) 30

**79.** 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

**80.** 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
(e) 9

**81.** 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 $n((A \cup B)^C) =$ **[Kerala (Engg.) 2004]**
(a) 17 (b) 9
(c) 11 (d) 3
(e) 16

## Relations

**1.** Let $A = \{1, 2, 3\}$. The total number of distinct relations that can be defined over $A$ is
(a) $2^9$ (b) 6
(c) 8 (d) None of these

**2.** Let $X = \{1, 2, 3, 4, 5\}$ and $Y = \{1, 3, 5, 7, 9\}$. Which of the following is/are relations from $X$ to $Y$
(a) $R_1 = \{(x, y) \mid y = 2 + x, x \in X, y \in Y\}$
(b) $R_2 = \{(1, 1), (2, 1), (3, 3), (4, 3), (5, 5)\}$

(c) $R_3 = \{(1,1),(1,3)(3,5),(3,7),(5,7)\}$

(d) $R_4 = \{(1,3),(2,5),(2,4),(7,9)\}$

**3.** Given two finite sets $A$ and $B$ such that $n(A) = 2$, $n(B) = 3$. Then total number of relations from $A$ to $B$ is

(a) 4 (b) 8

(c) 64 (d) None of these

**4.** The relation $R$ defined on the set of natural numbers as $\{(a, b) : a$ differs from $b$ by 3$\}$, is given by

(a) {(1, 4, (2, 5), (3, 6),.....} (b){(4, 1), (5, 2), (6, 3),.

(c) {(1, 3), (2, 6), (3, 9),..} (d) None of these

**5.** The relation $R$ is defined on the set of natural numbers as $\{(a, b) : a = 2b\}$. Then $R^{-1}$ is given by

(a) {(2, 1), (4, 2), (6, 3).....} (b){(1, 2), (2, 4), (3, 6)..

(c) $R^{-1}$ is not defined (d) None of these

**6.** The relation $R$ = {(1, 1), (2, 2), (3, 3), (1, 2), (2, 3), (1, 3)} on set $A$ = {1, 2, 3} is

(a) Reflexive but not symmetric

(b) Reflexive but not transitive

(c) Symmetric and Transitive

(d) Neither symmetric nor transitive

**7.** The relation "less than" in the set of natural numbers is

**[UPSEAT 1994, 98, 99; AMU 1999]**

(a) Only symmetric (b) Only transitive

(c) Only reflexive (d) Equivalence relation

**8.** Let $P = \{(x, y) | x^2 + y^2 = 1, x, y \in R\}$. Then $P$ is

(a) Reflexive (b) Symmetric

(c) Transitive (d) Anti-symmetric

**9.** Let $R$ be an equivalence relation on a finite set $A$ having $n$ elements. Then the number of ordered pairs in $R$ is

(a) Less than $n$

(b) Greater than or equal to $n$

(c) Less than or equal to $n$

(d) None of these

**10.** For real numbers $x$ and $y$, we write $xRy$ $x - y + \sqrt{2}$ is an irrational number. Then the relation $R$ is

(a) Reflexive (b) Symmetric

(c) Transitive (d) None of these

**11.** 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

**12.** 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

**13.** 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) $RoS$

**14.** 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)}

**15.** 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 $P \times Q$

**16.** 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

**[Kurukshetra CEE 1995]**

(a) $A$ (b) $B$

(c) $A \times B$ (d) $B \times A$

**17.** 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

**18.** 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) $m^n$

**19.** 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

**20.** 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

**21.** 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}

**22.** 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}

**23.** If $R = \{(x, y) | x, y \in Z, x^2 + y^2 \le 4\}$ 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

**24.** $R$ 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

**25.** 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

**26.** Let $R$ be a reflexive relation on a set $A$ and $I$ be the identity relation on $A$. Then

(a) $R \subset I$ (b) $I \subset R$
(c) $R = I$ (d) None of these

**27.** Let $A$ = {1, 2, 3, 4} and $R$ be a relation in $A$ given by $R$ = {(1, 1), (2, 2), (3, 3), (4, 4), (1, 2), (2, 1), (3, 1), (1, 3)}.
Then $R$ is

(a) Reflexive (b) Symmetric
(c) Transitive (d) An equivalence relation

**28.** An integer $m$ is said to be related to another integer $n$ if $m$ is a multiple of $n$. Then the relation is

(a) Reflexive and symmetric (b)Reflexive and transiti
(c) Symmetric and transitive (d)

**29.** The relation $R$ defined in $N$ as $aRb \Leftrightarrow b$ is divisible by $a$ is

(a) Reflexive but not symmetric
(b) Symmetric but not transitive
(c) Symmetric and transitive
(d) None of these

**30.** Let $R$ be a relation on a set $A$ such that $R = R^{-1}$, then $R$ is

(a) Reflexive (b) Symmetric
(c) Transitive (d) None of these

**31.** Let $R$ = {($a$, $a$)} be a relation on a set $A$. Then $R$ is

(a) Symmetric
(b) Antisymmetric
(c) Symmetric and antisymmetric
(d) Neither symmetric nor anti-symmetric

**32.** The relation "is subset of" on the power set $P(A)$ of a set $A$ is

(a) Symmetric (b) Anti-symmetric
(c) Equivalency relation (d) None of these

**33.** The relation $R$ defined on a set $A$ is antisymmetric if $(a, b) \in R \Rightarrow (b, a) \in R$ for

(a) Every ($a$, $b$) $\in R$ (b) No $(a, b) \in R$
(c) No $(a, b), a \neq b, \in R$ (d) None of these

**34.** In the set $A$ = {1, 2, 3, 4, 5}, a relation $R$ is defined by
$R$ = {($x$, $y$)| $x$, $y \in A$ and $x < y$}. Then $R$ is

(a) Reflexive (b) Symmetric
(c) Transitive (d) None of these

**35.** Let $A$ be the non-void set of the children in a family. The relation $x$ is a brother of $y$ on $A$ is

(a) Reflexive (b) Symmetric
(c) Transitive (d) None of these

**36.** 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

**37.** The void relation on a set $A$ is

(a) Reflexive (b) Symmetric and transitive
(c) Reflexive and symmetric (d)Reflexive and transitive

**38.** Let $R_1$ be a relation defined by $R_1 = \{(a, b) | a \geq b, a, b \in R\}$. 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

**39.** Which one of the following relations on $R$ is an equivalence relation

(a) $aR_1b \Leftrightarrow |a| = |b|$ (b) $aR_2b \Leftrightarrow a \geq b$
(c) $aR_3b \Leftrightarrow a \text{ divides } b$ (d) $aR_4b \Leftrightarrow a < b$

**40.** 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

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

(a) Symmetric and transitive (b)
(c) A partial order relation (d)An equivalence relation

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

**[Karnataka CET 1990]**

(a) Is reflexive
(b) Is symmetric
(c) Is transitive
(d) Possesses all the above three properties

**43.** The relation "congruence modulo $m$" is

(a) Reflexive only (b) Transitive only
(c) Symmetric only (d) An equivalence relation

**44.** Solution set of $x \equiv 3$ (mod 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

**45.** Let $R$ and $S$ be two equivalence relations on a set $A$. Then

(a) $R$ $S$ is an equivalence relation on $A$
(b) $R$ $S$ is an equivalence relation on $A$

(c) $R - S$ is an equivalence relation on $A$

(d) None of these

**46.** Let $R$ and $S$ be two relations on a set $A$. Then

(a) $R$ and $S$ are transitive, then $R \quad S$ is also transitive

(b) $R$ and $S$ are transitive, then $R \quad S$ is also transitive

(c) $R$ and $S$ are reflexive, then $R \quad S$ is also reflexive

(d) $R$ and $S$ are symmetric then $R \quad S$ is also symmetric

**47.** Let $R = \{(1, 3), (2, 2), (3, 2)\}$ and $S = \{(2, 1), (3, 2), (2, 3)\}$ be two relations on set $A = \{1, 2, 3\}$. Then $RoS =$

(a) $\{(1, 3), (2, 2), (3, 2), (2, 1), (2, 3)\}$

(b) $\{(3, 2), (1, 3)\}$

(c) $\{(2, 3), (3, 2), (2, 2)\}$

(d) $\{(2, 3), (3, 2)\}$

**48.** Let $L$ denote the set of all straight lines in a plane. Let $a$ relation $R$ be defined by $\alpha R\beta \Leftrightarrow \alpha \perp \beta, \alpha, \beta \in L$. Then $R$ is

(a) Reflexive (b) Symmetric

(c) Transitive (d) None of these

**49.** Let $R$ be a relation over the set $N \times N$ and it is defined by $(a, b)R(c, d) \Rightarrow a + d = b + c$. Then $R$ is

(a) Reflexive only (b) Symmetric only

(c) Transitive only (d) An equivalence relation

**50.** Let $n$ be a fixed positive integer. Define a relation $R$ on the set $Z$ of integers by, $aRb \Leftrightarrow n \mid a - b \mid$. Then $R$ is

(a) Reflexive (b) Symmetric

(c) Transitive (d) Equivalence

**51.** 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

**[AIEEE 2005]**

(a) An equivalence relation

(b) Reflexive and symmetric only

(c) Reflexive and transitive only

(d) Reflexive only

**52.** $x^2 = xy$ is a relation which is

(a) Symmetric (b) Reflexive

(c) Transitive (d) None of these

**53.** 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 **[AIEEE 2004]**

(a) Reflexive (b) Transitive

(c) Not symmetric (d) A function

**54.** The number of reflexive relations of a set with four elements is equal to **[UPSEAT 2004]**

(a) $2^{16}$ (b) $2^{12}$

(c) $2^8$ (d) $2^4$

**55.** 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

(e) None of the above is true

**56.** If $A$ is the set of even natural numbers less than 8 and $B$ is the set of prime numbers less than 7, then the number of relations from $A$ to $B$ is

(a) $2^9$ (b) $9^2$

(c) $3^2$ (d) $2^{9-1}$

## Critical Thinking

### Objective Questions

**1.** If $X = \{8^n - 7n - 1 : n \in N\}$ and $Y = \{49(n-1) : n \in N\}$, then

(a) $X \subseteq Y$ (b) $Y \subseteq X$

(c) $X = Y$ (d) None of these

**2.** If $N_a = \{an : n \in N\}$, then $N_3 \cap N_4 =$

(a) $N_7$ (b) $N_{12}$

(c) $N_3$ (d) $N_4$

**3.** Sets $A$ and $B$ have 3 and 6 elements respectively. What can be the minimum number of elements in $A \quad B$

**[MNR 1987; Karnataka CET 1996]**

(a) 3 (b) 6

(c) 9 (d) 18

**4.** If $A = [(x, y) : x^2 + y^2 = 25]$ and $B = [(x, y) : x^2 + 9y^2 = 144]$, then $A \cap B$ contains

**[AMU 1996; Pb. CET 2002]**

(a) One point (b) Three points

(c) Two points (d) Four points

**5.** If $A = [x : x$ is a multiple of 3] and $B = [x : x$ is a multiple of 5], then $A - B$ is ( $\overline{A}$ means complement of $A$)

**[AMU 1998]**

(a) $\overline{A} \cap B$ (b) $A \cap \overline{B}$

(c) $\overline{A} \cap \overline{B}$ (d) $\overline{A \cap B}$

**6.** If $A = \{x : x^2 - 5x + 6 = 0\}, B = \{2, 4\}, C = \{4, 5\}$, then $A \times (B \cap C)$ is **[Kerala (Engg.) 2002]**

(a) $\{(2, 4), (3, 4)\}$ (b) $\{(4, 2), (4, 3)\}$

(c) $\{(2, 4), (3, 4), (4, 4)\}$ (d) $\{(2,2), (3,3), (4,4), (5,5)\}$

**7.** In a college of 300 students, every student reads 5 newspaper and every newspaper is read by 60 students. The no. of newspaper is

(a) At least 30 (b) At most 20

(c) Exactly 25 (d) None of these

**8.** Let $A = \{1, 2, 3, 4, 5\}$; $B = \{2, 3, 6, 7\}$. Then the number of elements in $(A \times B) \quad (B \times A)$ is

(a) 18 (b) 6

(c) 4 (d) 0

**9.** Let $A = \{1, 2, 3\}$, $B = \{1, 3, 5\}$. $A$ relation $R: A \to B$ is defined by $R = \{(1, 3), (1, 5), (2, 1)\}$. Then $R^{-1}$ is defined by

(a) $\{(1,2), (3,1), (1,3), (1,5)\}$ (b) $\{(1, 2), (3, 1), (2, 1)\}$

(c) $\{(1, 2), (5, 1), (3, 1)\}$ (d) None of these

**10.** Let $R$ be the relation on the set $R$ of all real numbers defined by $a\ R\ b$ iff $|a - b| \le 1$. Then $R$ is

(a) Reflexive and Symmetric (b)

(c) Transitive only (d) Anti-symmetric only

**11.** With reference to a universal set, the inclusion of a subset in another, is relation, which is

(a) Symmetric only (b) Equivalence relation

(c) Reflexive only (d) None of these

**12.** Let $R$ be a relation on the set $N$ of natural numbers defined by $nRm \quad n$ is a factor of $m$ (*i.e.,* $n|m$). Then $R$ is

(a) Reflexive and symmetric

(b) Transitive and symmetric

(c) Equivalence

(d) Reflexive, transitive but not symmetric

**13.** Let $R$ and $S$ be two non-void relations on a set $A$. Which of the following statements is false

(a) $R$ and $S$ are transitive $\quad R \quad S$ is transitive

(b) $R$ and $S$ are transitive $\quad R \quad S$ is transitive

(c) $R$ and $S$ are symmetric $\quad R \quad S$ is symmetric

(d) $R$ and $S$ are reflexive $\quad R \quad S$ is reflexive

**14.** Let a relation $R$ be defined by $R = \{(4, 5); (1, 4); (4, 6); (7, 6); (3, 7)\}$ then $R^{-1}oR$ is

(a) $\{(1, 1), (4, 4), (4, 7), (7, 4), (7, 7), (3, 3)\}$

(b) $\{(1, 1), (4, 4), (7, 7), (3, 3)\}$

(c) $\{(1, 5), (1, 6), (3, 6)\}$

(d) None of these

**15.** Let $R$ be a relation on the set $N$ be defined by $\{(x, y)| \ x, y \quad N, 2x + y = 41\}$. Then $R$ is

(a) Reflexive (b) Symmetric

(c) Transitive (d) None of these