

Answers

Set theory

1	d	2	b	3	a	4	c	5	c
6	b	7	a	8	d	9	c	10	b
11	c	12	b	13	c	14	b	15	c
16	d	17	a	18	b	19	c	20	b
21	c	22	c	23	a,b	24	d	25	b
26	b	27	d	28	b	29	a	30	b
31	b	32	c	33	b	34	b	35	a
36	a	37	b	38	a	39	a	40	c
41	b	42	b	43	c	44	a	45	d
46	a	47	a	48	c	49	c	50	c
51	c	52	b	53	a	54	d	55	c
56	a	57	a	58	d	59	c	60	b
61	d	62	a	63	a	64	b	65	b
66	a	67	b	68	c	69	a	70	e
71	c	72	c	73	a	74	d	75	d
76	a	77	b	78	c	79	d	80	b
81	d								

Relations

1	a	2	a,b,c	3	c	4	b	5	b
6	a	7	b	8	b	9	b	10	a
11	b	12	a	13	b	14	c	15	d
16	c	17	c	18	a	19	a	20	d
21	d	22	c	23	c	24	a	25	a
26	b	27	a,b	28	b	29	a	30	b
31	c	32	b	33	c	34	c	35	bc
36	c	37	b	38	b	39	a	40	c
41	d	42	d	43	d	44	c	45	b
46	b,c,d	47	c	48	b	49	d	50	a,b,c,d
51	c	52	b	53	c	54	d	55	a
56	a								

Critical Thinking Questions

1	a	2	b	3	b	4	d	5	b
6	a	7	c	8	c	9	c	10	a
11	d	12	d	13	a	14	a	15	d

Set theory

- (d) Since, intelligency is not defined for students in a class *i.e.*, Not a well defined collection.
- (b) Since $x^2 + 1 = 0$, gives $x^2 = -1 \Rightarrow x = \pm i$
 $\therefore x$ is not real but x is real (given)
 \therefore No value of x is possible.
- (a) $x^2 = 16 \quad x = \pm 4$
 $2x = 6 \quad x = 3$
 There is no value of x which satisfies both the above equations. Thus, $A = \phi$.
- (c) Number of subsets of $A = {}^nC_0 + {}^nC_1 + \dots + {}^nC_n = 2^n$.
- (c) Number of proper subsets of the set $\{1, 2, 3\}$
 $= 2^3 - 2 = 6$.
- (b) $B \cap C = \{4\}$, $\therefore A \cup (B \cap C) = \{1, 2, 3, 4\}$.
- (a) $A \cap B \subseteq A$. Hence $A \cup (A \cap B) = A$.
- (d) $A \cap (A \cap B)^c = A \cap (A^c \cup B^c)$
 $= (A \cap A^c) \cup (A \cap B^c) = \phi \cup (A \cap B^c) = A \cap B^c$.
- (c) Since $y = \frac{1}{x}$, $y = -x$ meet when $-x = \frac{1}{x}$
 $x^2 = -1$, which does not give any real value of x .
 Hence, $A \cap B = \phi$.
- (b) $A = \{x : x \in R, -1 < x < 1\}$
 $B = \{x : x \in R : x - 1 \leq -1 \text{ or } x - 1 \geq 1\}$
 $= \{x : x \in R : x \leq 0 \text{ or } x \geq 2\}$
 $\therefore A \cup B = R - D$, where $D = \{x : x \in R, 1 \leq x < 2\}$.
- (c) Since, $y = e^x$ and $y = x$ do not meet for any $x \in R$
 $\therefore A \cap B = \phi$.
- (b) Since, $4^n - 3n - 1 = (3+1)^n - 3n - 1$
 $= {}^nC_0 3^n + {}^nC_1 3^{n-1} + \dots + {}^nC_{n-1} 3 + {}^nC_n - 3n - 1$
 $= {}^nC_2 3^2 + {}^nC_3 3^3 + \dots + {}^nC_n 3^n$, (${}^nC_0 = {}^nC_n$, ${}^nC_1 = {}^nC_{n-1}$ etc.)
 $= 9[{}^nC_2 + {}^nC_3(3) + \dots + {}^nC_n 3^{n-1}]$
 $\therefore 4^n - 3n - 1$ is a multiple of 9 for $n \geq 2$.
 For $n = 1$, $4^n - 3n - 1 = 4 - 3 - 1 = 0$,
 For $n = 2$, $4^n - 3n - 1 = 16 - 6 - 1 = 9$
 $\therefore 4^n - 3n - 1$ is a multiple of 9 for all $n \in N$
 $\therefore X$ contains elements, which are multiples of 9, and clearly Y contains all multiples of 9.
 $\therefore X \subseteq Y$ *i.e.*, $X \cup Y = Y$.

13. (c) $n(A^c \cap B^c) = n[(A \cup B)^c] = n(U) - n(A \cup B)$
 $= n(U) - [n(A) + n(B) - n(A \cap B)]$
 $= 700 - [200 + 300 - 100] = 300.$