PRACTICE EXERCISES

MULTIPLE CHOICE QUESTIONS (MCQs)

Mark the correct alternative in each of the following:

1. 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.
2. If R is a relation on the set $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ given by $x\ R\ y \Leftrightarrow y = 3x$, then $R =$
   (a) $\{(3, 1), (6, 2), (8, 2), (9, 3)\}$ (b) $\{(3, 1), (6, 2), (9, 3)\}$
   (c) $\{(3, 1), (2, 6), (3, 9)\}$ (d) none of these.
3. 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.
4. If $A = \{1, 2, 3\}$, $B = \{1, 4, 6, 9\}$ and R is a relation from A to B defined by 'x is greater than y'. The range of R is
   (a) $\{1, 4, 6, 9\}$ (b) $\{4, 6, 9\}$ (c) $\{1\}$ (d) none of these.
5. If $R = \{(x, y) : x, y \in Z, x^2 + y^2 \leq 4\}$ is a relation on Z, then domain of R is
   (a) $\{0, 1, 2\}$ (b) $\{0, -1, -2\}$ (c) $\{-2, -1, 0, 1, 2\}$ (d) none of these.
6. A relation R is defined from $\{2, 3, 4, 5\}$ to $\{3, 6, 7, 10\}$ by : $x\ R\ y \Leftrightarrow x$ is relatively prime to y. Then, domain of R is
   (a) $\{2, 3, 5\}$ (b) $\{3, 5\}$ (c) $\{2, 3, 4\}$ (d) $\{2, 3, 4, 5\}$.
7. A relation ϕ from C to R is defined by $x\ \phi\ y \Leftrightarrow |x| = y$. Which one is correct?
   (a) $(2 + 3i)\ \phi 13$ (b) $3\ \phi(-3)$ (c) $(1 + i)\ \phi 2$ (d) $i\ \phi 1$.
8. 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) $\{1, 2, 3, 4\}$.
9. 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) $\{(11, 8), (13, 10)\}$
   (c) $\{(10, 13), (8, 11), (12, 10)\}$ (d) none of these.
10. 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
11. Let R be a relation from a set A to a set B, then
    (a) $R = A \cup B$ (b) $R = A \cap B$ (c) $R \subseteq A \times B$ (d) $R \subseteq B \times A$

12. 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

13. If R is a relation on a finite set having n elements, then the number of relations on A is

(a) 2^n (b) 2^{n^2} (c) n^2 (d) n^n.

14. Let $n(A)=m$ and $n(B)=n$. Then the total number of non-empty relations that can be defined from A to B is

(a) m^n (b) n^m-1 (c) $mn-1$ (d) $2^{mn}-1$

ASSERTION - REASON BASED MCQs

Each of the following questions contains STATEMENT-1 (Assertion) and STATEMENT-2 (Reason) and has following four choices (a), (b), (c) and (d), only one of which is the correct answer. Mark the correct choice.

(a) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for statement-1.

(b) Statement-1 is true, Statement-2 is true; Statement-2 is not a correct explanation for statement-1.

(c) Statement-1 is true, Statement-2 is false.

(d) Statement-1 is false, Statement-2 is true.

15. Statement-1 (A): Let A and B be two sets having m and n elements respectively, then the number of non-empty relations from A to B is $2^{mn}-1$.

Statement-2 (R): Total number of relations from a set A having m elements to a set consisting of n elements is 2^{mn}.

16. Statement-1 (A): Let A be a finite set consisting of n elements, then the number of relations on A is 2^{n^2}.

Statement-2 (R): A relation on a set A is a subset of set A.

17. Statement-1 (A): Let R be a relation on set $A=\{1, 2, 3\}$ which relates every element to itself. The number of such relations on A is 64.

Statement-2 (R): The number of subsets of a set consisting of n elements is 2^n.

18. Statement-1 (A): If $n(A\times B)=45$, then $n(A)$ cannot be 17.

Statement-2 (R): $n(A\times B)=n(A)\times n(B)$

19. Statement-1 (A): Let $A=\{1, 2, 3, 4,5, 6\}$, then the number of ordered pairs in any relation on A cannot exceed 64.

Statement-2 (R): A relation on set A is a subset of A.

20. Statement-1 (A): If A and B are two sets such that $n(A \cap B') = 9, n(A' \cap B) = 10$ and $n(A \cap B) = 24$, then $n(A \times B) = 105$.

Statement-2 (R): $n(A \times B) = n(A) \times n(B)$.

21. Statement-1 (A): Let $A = \{1, 2, 3\}$, then the number of relations on A which relate every element of A to itself is 448.

Statement-2 (R): A relation on set A is a subset of $A \times A$.

22. Statement-1 (A): The range of the relation $R = \{(x, 2|x|) : x \in R\}$ is $[0, \infty)$.

Statement-2 (R): The range of the relation $R = \{(x, |x|) : x \in R\}$ is $[0, \infty)$.

23. Statement-1 (A): The domain of the relation $R = \{(x, y) : x^2 + y^2 = 64, x, y \in Z\}$ is $\{-8, 0, 8\}$.

Statement-2 (R): Let $R = \{(x, y) : x^2 + y^2 = 64, x, y \in Z\}$ be a relation on Z. Then, $R = R^{-1}$.

CASE STUDY BASED QUESTIONS

24. Let R be a relation from set $A = \{2, 3, 4, 5\}$ to set $B = \{3, 6, 7, 10\}$ defined as $(x, y) \in R$ iff x divides y i.e. $R = \{(x, y) : x \text{ divides } y, x \in A, y \in B\}$.

Based on this information, answer the following questions:

(i) R as a set of ordered pairs is

(a) $\{(2, 2), (2, 6), (2, 10), (3, 3), (3, 6), (4, 4), (5, 5), (5,10)\}$

(b) $\{(2, 6), (2, 10), (3, 3), (3, 6), (5,10)\}$

(c) $\{(2, 2), (2, 6), (2, 10), (3, 3), (3, 6), (5, 5), (5,10)\}$

(d) $\{(2, 2), (2, 6), (2, 10), (3, 3), (3, 6), (5,10)\}$

(ii) R^{-1} as a set of ordered pairs is

(a) $\{(6, 2), (10, 2), (3, 3), (6, 3), (10, 5)\}$

(b) $\{(2, 2), (6, 2), (10, 2), (3, 3), (6, 3), (4, 4), (5, 5), (10, 5)\}$

(c) $\{(2, 2), (6, 2), (10, 2), (3, 3), (6, 3), (10, 5)\}$

(d) $\{(2, 2), (6, 2), (10, 2), (3, 3), (6, 3), (5, 5), (10, 5)\}$

(iii) Domain of R^{-1} is

(a) $\{2, 3, 4, 5, 6, 10\}$ (b) $\{3, 6, 10\}$

(c) $\{2, 3, 6, 10\}$ (d) $\{2, 3, 5, 6, 10\}$

(iv) Range of R is

(a) $\{2, 3, 4, 5, 6, 10\}$ (b) $\{3, 6, 10\}$

(c) $\{2, 3, 6, 10\}$ (d) $\{2, 3, 5, 6, 10\}$