# EXERCISE LEVEL –I

EL– I

Q.1 If the Cartesian product of sets P and Q yields an empty set, which among the following is a null set?

(a) only P   (b) only Q   (c) either P or Q   (d) both P and Q

Q.2 If (a, b) = (x, y) then_____

(a) a=x   (b) a=y   (c) a=y and b=x   (d) a=x and b=y

Q.3 If set P contains 4 elements and set Q contains 5 elements, determine the total number of elements in the Cartesian product P × Q.

(a) 9   (b) 4^5 (c) 20   (d) 5^4

Q.4 Find values of x and y if (x+2, y-3) = (5,7).

(a) x=3 and y=10   (b) x=3 and y=4   (c) x=7 and y=4   (d) x=7 and y=10

Q.5 Does (a, b) equal (b, a)?

(a) True   (b) False

Q.6 If the Cartesian product of set P × Q contains 10 elements which of the following is not possible?

(a) n(P)=1 and n(Q)=10   (b) n(P)=10 and n(Q)=1

(c) n(P)=2 and n(Q)=5   (d) n(P)=5 and n(Q)=4

Q.7 If P is equal to Q, is it true or false that P × Q equals Q × P?

(a) True   (b) False

Q.8 If A × B = {(1, a), (1, b), (1, c), (2, a), (2, b), (2, c)} then determine the set A.

(a) {1}   (b) {1, 2}   (c) {1, a}   (d) {a, b, c}

Q.9 If A × B = {(1, a), (1, b), (1, c), (2, a), (2, b), (2, c)} then identify set B.

(a) {1}   (b) {1, 2}   (c) {1, a}   (d) {a, b, c}

Q.10 If set A has 2 elements and set B has 3 elements, determine the number of subsets in the Cartesian product A × B.

(a) 6   (b) 8   (c) 32   (d) 64

Q.11 In a function mapping from set A to set B, each element of set A possesses a _____ image in set B.

(a) one and only one   (b) different   (c) same   (d) many

Q.12 In a function from set A to set B, it is possible for an image to have more than one preimage.

(a) True   (b) False

Q.13 Consider R as a relation defined on the set of natural numbers {(x, y): y = 2x}. Can this relation be characterized as a function?

(a) True   (b) False

Q.14 Which of the following does not represent a function?

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

(c) {(1,2), (1,4), (2,5), (3,8)}   (d) {(1,1), (2,2), (3,3)}

Q.15 In this graph Which function is shown?

(a) Constant   (b) Modulus   (c) Identity   (d) Signum function
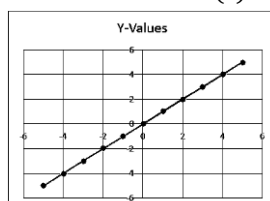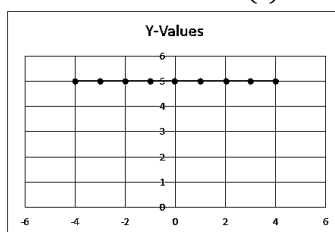
Q.16 Which function is illustrated in the graph?

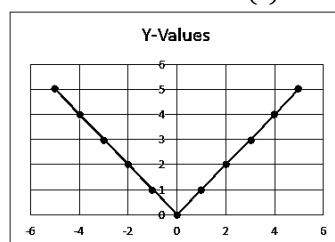(a) Constant   (b) Modulus   (c) Identity   (d) Signum function

Q.17 What function does the graph represent?

(a) Constant   (b) Modulus   (c) Identity   (d) Signum function

Q.18 $f(x) = \left\{\frac{|x|}{x} \text{ for } x \neq 0 \text{ and } 0 \text{ for } x = 0\right\}$ what function is being referred to here?

(a) Constant   (b) Modulus   (c) Identity   (d) Signum function

Q.19 Identify the domain of function |x|.

(a) Set of real numbers   (b) Set of positive real numbers
(c) Set of integers   (d) Set of natural numbers

Q.20 Determine the range of function |x|.

(a) Set of real numbers   (b) Set of positive real numbers
(c) Set of integers   (d) Set of natural numbers

Q.21 Determine the domain of the function $f(x) = \sqrt{9 - x^2}$

(a) (0,3)   (b) [0,3]   (c) [-3,3]   (d) (-3,3)

Q.22 Determine the range of the function $f(x) = \sqrt{9 - x^2}$.

(a) R   (b) R^+ (c) [-3,3]   (d) [0,3]

Q.23 If $(x + 1, y - 2) = (3,1)$ then x and y are

(a) 3,4   (b) 2,3   (c) 2,4   (d) 1,1

Q.24 If $P = \{2,3\}$, then $P \times P$ is equal to

(a) {(2,3), (3,2)}   (b) {(2,2), (3,3)}
(c) {(2,2), (2,3), (3,2)}   (d) {(2,2), (2,3), (3,2), (3,3)}

Q.25 Let, $A = \{1,2,3,4,5\}, B = \{2,3,6,7\}$. Then the number of elements in $(A \times B) \cap (B \times A)$ is

(a) 18   (b) 6   (c) 4   (d) 0

Q.26 If, $A \times B = \{(1,3), (1,4), (2,3), (2,4)\}$. Then

(a) $A = \{1,2\}, B = \{1,4\}$ (b) $A = \{1,2\}, B = \{4,1\}$
(c) $A = \{1,2\}, B = \{3,4\}$ (d) $A = \{1,2\}, B = \{1,2,3\}$

Q.27 If n(A) denotes the number of element in set A and if $n(A) = 4, n(B) = 5$ and $n(A \cap B) = 3$ then $n[(A \times B) \cap (B \times A)] =$

(a) 8   (b) 9   (c) 10   (d) 11

Q.28 If (1, 3), (2, 5) and (3, 3) are the 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) {(1,3), (3,1)}

Q.29 The relation R defined on the set of natural numbers as {(a, b) : a – b = 3}, is given by

(a) {(1,4), (2,5), (3,6) ...}   (b) {(4,1), (5,2), (6,3) ...}
(c) {(1,3), (2,6), (3,5) ...}   (d) {(3,5), (5,7), (7,9) ...}

Q.30 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) $2^9 - 1$

Q.31 Let X = {1, 2, 3, 4, 5} and Y = {1, 3, 5, 7, 9}. Which of the following is a relation from X to Y?

(a) $R_1 = \{(x, y) \mid y = 2 + x, x \in X, y \in Y\}$ (b) $R_2 = \{(1,1), (2,1), (3,3), (4,3), (5,6)\}$

(c) $R_3 = \{(1,1), (1,3), (3,5), (3,7), (7,3), (5,7)\}$ (d) $R_4 = \{(1,3), (2,5), (2,7), (5,9)\}$

Q.32 Domain of the function $f(x) = \sqrt{2 - 2x - x^2}$ is

(a) $-\sqrt{3} \le x \le \sqrt{3}$ (b) $-1 - \sqrt{3} \le x \le -1 + \sqrt{3}$

(c) $-1 \le x \le 2$ (d) $-2 + \sqrt{3} \le x \le -2 - \sqrt{3}$

Q.33 Let, $f(x) = \dfrac{1}{\sqrt{x + |x|}}$, then domain of f is

(a) $(0, \infty)$ (b) $(-\infty, 0)$ (c) $(-\infty, \infty)$ (d) $(-\infty, \infty) - \{0\}$

Q.34 For any real number x, the square $\sqrt{x^2}$ is equal to.

(a) x   (b) – x   (c) |x| (d) Can't say

Q.35 The range of $f(x) = sgn(2^x) + sgn(|x - 5|)$ is

(a) {1, 2}   (b) {2}   (c) {−2,0,2}   (d) {−1,0,1}

Q.36 If $|x - 3| + |x + 5| = 8$ then the interval satisfying the value of x is

(a) $[-10, -5]$ (b) $[3,8] \cup [10,12]$

(c) $[-5,3]$ (d) $[-7, -5] \cup [5,7]$

Q.37 If $x < 5$ then $\sqrt{x^2 - 10x + 25} + x + 7$ is equal to

(a) 7   (b) 5   (c) 12   (d) 0

Q.38 $|x - 2| - 3 \, | > 1$, then x belongs to

(a) $(-\infty, -2) \cup (0,4) \cup (6, \infty)$ (b) $(-1,1)$

(c) $(-\infty, -1) \cup (1, \infty)$ (d) $(-2,2)$

Q.39 If $||x - 3| - 4| < 2$, then x belongs to

(a) $(-6, -2) \cup (2,6)$ (b) $(-2,2)$ (c) $(-6,6)$ (d) $(-3,1) \cup (5,9)$

Q.40 $[|x|] = 4$, then interval of x is

(a) $x < -4$ (b) $x \in (-5, -4] \cup [4,5)$

(c) $x \in [-4,4]$ (d) $x \in$ Integers

Q.41 If $[x + [x]] \le 2$ then x belongs to

(a) $(-\infty, 1)$ (b) $(-\infty, 3)$ (c) $(-2,2)$ (d) $(-\infty, 2)$

Q.42 Range of $f(x) = 20^x$ is

(a) $(0, \infty)$ (b) $(0,1)$ (c) $(-\infty, \infty)$ (d) $(0,20)$

Q.43 $\log_3 \log_2 \log_{\sqrt{5}}(5^4)$ is equal to

(a) 2   (b) 1   (c) 3   (d) 0

Q.44 $7\log\dfrac{16}{15} + 5\log\dfrac{25}{24} + 3\log\dfrac{81}{80}$ is equal to

(a) log 1   (b) log 2   (c) log 3   (d) log 5

Q.45 $2(\log a + \log a^2 + \log a^3 + \log a^4 + \cdots + \log a^n)$ is equal to

(a) $\dfrac{n(n+1)}{2}\log a$ (b) $n(n + 1)\log a$ (c) $n\log a$ (d) $(n + 1)\log a$

Q.46 $3^{((4\log_9 7) - 1)}$ is

(a) 49   (b) $\dfrac{49}{3}$ (c) 24   (d) 48

Q.47 Range of the $f(x) = \dfrac{e^x - 1}{e^x + 1}$

(a) $(0, \infty)$ (b) $(-\infty, 0)$ (c) $(1, \infty)$ (d) $(-1,1)$

Q.48 If $f(x^2) = 4x^6 + 3x^4$, then f(5) is equal to

(a) 570   (b) 500   (c) 420   (d) 840

Q.49 If $f(x) = 4x^3 + 3x^2 + 3x + 4$, then $x^3 f(\frac{1}{x})$ is equal to

(a) $f(-x)$ (b) $f(x + 2)$ (c) $[f(\frac{1}{x})]^2$ (d) $f(x)$

Q.50 If $f(x) = \log(\frac{1+x}{1-x})$, then $f(\frac{2x}{1+x^2})$ is equal to

(a) $(f(x))^2$ (b) $(f(x))^3$ (c) $2f(x)$ (d) $3f(x)$

EXERCISE LEVEL –II

EL– II

Q.1 Determine the values of x and y in the equation (x-1, -5) = (3, y-2).

Q2 If f(x) represents the signum function, calculate the value of f(x) when x is equal to 5.

Q.3 Consider the set A = {1, 3, 6, 9}. Define the relation R on A as R = {(x, y) : x ∈ A, y ∈ A, and x divides y}. Determine the roster form of R.

Q.4 Determine the domain of the given expression $f(x) = \sqrt{16 - x^2}$.

Q.5 Determine the domain of the function $f(x) = x|x|$

Q.6 Find the range of $|x - 15|$.

Q.7 Suppose f and g are two functions defined by $f(x) = 3x^2 + 6x + 5$ and $g(x) = 3x - 6$ then the find value of 2f + g at x = 1.

Q.8 If $f(x) = x^2 - 3x + 1$, find x ∈ R such that f(2x) = f(x).

Q.9 Let A = {1,2,3,4} and B = {x, y, z} Let R be a relation from A to B defined
R = {(1, x), (1, z), (3, x)(4, y)}. Draw arrow diagram of relation R.

Q.10 Let $f(x) = \sqrt{x^2 + 2x + 1} - \sqrt{x^2 - 2x + 1}$ then value of $f(\frac{-5}{4}) + f(\frac{3}{4}) + f(\frac{7}{4})$ is equal to

Q.11 The value of $81^{\frac{1}{\log_5 3}} + 27^{\log_9 36} + 3^{\frac{4}{\log_7 9}}$ is equal to

Q.12 The product of roots of the equation $\frac{\log_8 (\frac{8}{x^2})}{(\log_8 x)^2} = 3$ is equal to

Q.13 Determine domain and range of the relation R = {(x, y): y = |x - 1|, x ∈ Z and |x| ≤ 3}

Q.14 For any sets A, B, C, D, prove that (A × B) ∩ (C × D) = (A ∩ C) × (B ∩ D)

ANSWER KEY – LEVEL – I

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