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Standard: XI **Subject: Mathematics**

Unit:1 Sets Relations and Functions

Choose the correct or the most suitable answer.

1. Let $\mathbb{R}$ be the set of all real numbers. Consider the following subsets of the plane $\mathbb{R} \times \mathbb{R}$: $S = \{(x, y) : y = x + 1 \text{ and } 0 < x < 2\}$ and $T = \{(x, y) : \text{x} - \text{y is an integer}\}$ then which of the following is true?
   (a) T is an equivalence relation but S is not an equivalence relation.
   (b) Neither S nor T is an equivalence relation
   (c) Both S and T are equivalence relation
   (d) S is an equivalence relation but T is not an equivalence relation.

2. If $n((A \times B) \cap (A \times C)) = 8$ and $n(B \cap C) = 2$, then $n(A)$ is
   (a) 6 (b) 4 (c) 8 (d) 16

3. If $n(A) = 2$ and $n(B \cup C) = 3$, then $n[(A \times B) \cup (A \times C)]$ is
   (a) 2^3 (b) 3^2 (c) 6 (d) 5

4. If $A = \{(x, y) : y = e^x, x \in \mathbb{R}\}$ and $B = \{(x, y) : y = e^{-x}, x \in \mathbb{R}\}$ then $n(A \cap B)$ is
   (a) Infinity (b) 0 (c) 1 (d) 2

5. $A = \{(x, y) : y = \sin x, x \in \mathbb{R}\}$ and $B = \{(x, y) : y = \cos x, x \in \mathbb{R}\}$ then $A \cap B$ contains
   (a) no element (b) infinitely many elements
   (c) only one element (d) cannot be detrmined.

6. The relation $\mathbb{R}$ defined on a set $A = \{0, -1, 1, 2\}$ by xRy if $|x^2 + y^2| \leq 2$, then which one of the following is true?
   (a)$R = \{(0, 0), (0, -1), (0, 1), (-1, 0), (-1, 1), (1, 2), (1, 0)\}$
   (b)$R^{-1} = \{(0, 0), (0, -1), (0, 1), (-1, 0), (1, 0)\}$
   (c)Domain of $\mathbb{R}$ is $\{0, -1, 1, 2\}$
   (d)Range of $\mathbb{R}$ is $\{0, -1, 1\}$

7. If $f(x) = |x - 2| + |x + 2|, x \in \mathbb{R}$ then
   (a) $f(x) = \begin{cases} -2x & \text{if } x \in (-\infty, 2) \\ 4 & \text{if } x \in [-2, 2] \\ 2x & \text{if } x \in (2, \infty) \end{cases}$
   (b)$f(x) = \begin{cases} 2x & \text{if } x \in (-\infty, -2) \\ 4x & \text{if } x \in (-2, 2] \\ -2x & \text{if } x \in (2, \infty) \end{cases}$
   (c) $f(x) = \begin{cases} -2x & \text{if } x \in (-\infty, -2] \\ -4x & \text{if } x \in (-2, 2] \\ 2x & \text{if } x \in (2, \infty) \end{cases}$
   (d) $f(x) = \begin{cases} -2x & \text{if } x \in (-\infty, -2] \\ 2x & \text{if } x \in (-2, 2] \\ 2x & \text{if } x \in (2, \infty) \end{cases}$

8. Let A and B be subsets of the universal set $\mathbb{N}$, the set of natural numbers. Then $A' \cup [(A \cap B) \cup B']$ is
   (a) A (b) B (c) C (d) D

9. The number of students who take both the subjects Mathematics and Chemistry is 70% This represents 10% of the enrollment in Mathematics and 14% of the enrollment in Chemistry. The number of students take at least one of these two subjects, is
   (a) 1120 (b) 1130 (c) 1100 (d) insufficient data

10. If two sets A and B have 17 elements in common, then the number of elements common to the set $A \times B$ and $B \times A$ is

(a) 2^{17} (b) 17^2 (c) 34 (d) insufficient data

11. For non-empty sets A and B, if $A \subset B$ then $(A \times B) \cap (B \times A)$ is equal to

(a) $A \cap B$ (b) $A \times A$ (c) $B \times B$ (d) None of these.

12. The number of relations on a set containing 3 elements is

(a) 9 (b) 81 (c) 512 (d) 1024

13. Let $\mathbb{R}$ be the universal relations on a set x with more than one element. Then $\mathbb{R}$ is

(a) not reflexive (b) not symmetric (c) transitive (d) none of the above

14. Let $X = \{1, 2, 3, 4\}$ and $R = \{(1, 1), (1, 2), (1, 3), ()2, 2, (3, 3), (2, 1), (3, 1), (1, 4), (4, 1)\}$. Then $\mathbb{R}$ is

(a) reflexive (b) symmetric (c) transitive (d) equivalence

15. The range of the function $\dfrac{1}{1 - 2\sin x}$ is

(a) $(-\infty, -1) \cup \left(\dfrac{1}{3}, \infty\right)$ (b) $\left(-1, \dfrac{1}{3}\right)$ (c) $\left[-1, \dfrac{1}{3}\right]$ (d) $(-\infty, -1] \cup \left[\dfrac{1}{3}, \infty\right)$

16. The range of the function $f(x) = |\lfloor x \rfloor - x|, x \in \mathbb{R}$ is

(a) [0,1] (b) [0,∞) (c) [0,1) (d) (0,1)

17. The rule $f(x) = x^2$ is a bijection if the domain and the co-domain are given by

(a) $\mathbb{R}, \mathbb{R}$ (b) $\mathbb{R}, (0, \infty)$ (c) $(0, \infty), \mathbb{R}$ (d) $[0, \infty), [0, \infty)$

18. The number of constant functions from a set containing m elements to a set containing n elements is

(a) mn (b) m (c) n (d) m+n

19. The function $f : [0, 2\pi] \longrightarrow [-1, 1]$ defined by $f(x) = x^2$ is onto, then S is

(a) one-to-one (b) onto (c) bijection (d) cannot be defined

20. If the function $f : [-3, 3] \longrightarrow S$ defined by $f(x) = \sin x$ is

(a) [-9,9] (b) $\mathbb{R}$ (c) [-3,3] (d) [0,9]

21. Let $= \{1, 2, 3, 4\}, Y = \{a, b, c, d\}$ and $f = \{(1, a), (4, b), (2, c), (3, d), (2, d)\}$. Then f is

(a) an one to one function (b) an onto function

(c) a function which is not one-to-one (d) not a function

22. The inverse of $f(x) = \begin{cases} x & \text{if } x < 1 \\ x^2 & \text{if } 1 \le x \le 4 \\ 8\sqrt{x} & \text{if } x > 4 \end{cases}$ is

(a) $f^{-1}(x) = \begin{cases} x & \text{if } x < 1 \\ \sqrt{x} & \text{if } 1 \le x \le 16 \\ \dfrac{x^2}{64} & \text{if } x > 16 \end{cases}$ (b) $f^{-1}(x) = \begin{cases} -x & \text{if } x < 1 \\ \sqrt{x} & \text{if } 1 \le x \le 16 \\ \dfrac{x^2}{64} & \text{if } x > 16 \end{cases}$

(c) $f^{-1}(x) = \begin{cases} x^2 & \text{if } x < 1 \\ \sqrt{x} & \text{if } 1 \le x \le 16 \\ \dfrac{x^2}{64} & \text{if } x > 16 \end{cases}$ (d) $f^{-1}(x) = \begin{cases} 2x & \text{if } x < 1 \\ \sqrt{x} & \text{if } 1 \le x \le 16 \\ \dfrac{x^2}{8} & \text{if } x > 16 \end{cases}$

23. Let $f : \mathbb{R} \longrightarrow \mathbb{R}$ be defined by $f(x) = 1 - |x|$. then the range of f is

(a) $\mathbb{R}$ (b) $(1, \infty)$ (c) $(-1, \infty)$ (d) $-\infty, 1$

24. Let $f : \mathbb{R} \longrightarrow \mathbb{R}$ is defined by $f(x) = \sin x + \cos x$ is

(a) an odd function (b) neither an odd function nor an even function

(c) an even function (d) both odd function and even function.

25. The function $f : \mathbb{R} \longrightarrow \mathbb{R}$ is defined by $f(x) = \dfrac{(x^2 + \cos x)(1 + x^4)}{(x - \sin x)(2x - x^3)} + e^{-|x|}$

(a) an odd function (b) neither an odd function nor an even function

(c) an even function (d) both odd function and even function.

UNIT 2 BASIC ALGEBRA

Choose the correct or the most suitable answer.

1. If $\dfrac{|x-2|}{x-2} \geq 0$, then x belongs to

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

2. The solution of $5x - 1 < 24$ and $5x + 1 > -24$ is

(a) (4,5) (b) (-5,-4) (c) (-5,5) (d) (-5,4)

3. The solution set of the following inequality $|x - 1| \geq |x - 3|$ is

(a) [0,2] (b) $[2, \infty)$ (c) (0,2) (d) $(-\infty, 2)$

4. The value of $\log_{\sqrt{2}} 512$ is

(a) 16 (b) 18 (c) 9 (d) 12

5. The value of $\log_3 \dfrac{1}{81}$ is

(a) -2 (b) -8 (c) -4 (d) -9

6. If a and b are the real roots of the equation $x^2 - kx + c = 0$, then the distance beween the points $(a, 0)$ and $(b, 0)$ is

(a) $\sqrt{k^2 - 4c}$ (b) $\sqrt{4k^2 - c}$ (c) $\sqrt{4c - k^2}$ (d) $\sqrt{k - 8c}$

7. If $\dfrac{kx}{(x+2)(x-1)} = \dfrac{2}{x+2} + \dfrac{1}{x-1}$, then the value of k is

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

8. If $\dfrac{1 - 2x}{(3 + 2x - x^2)} = \dfrac{A}{3 - x} + \dfrac{B}{x + 1}$,Then the value of $A + B$ is

(a) -1/2 (b) -2/3 (c) 1/2 (d) 2/3

9. The number of roots of $(x + 3)^4 + (x + 5)^4 = 16$ is

(a) 4 (b) 2 (c) 3 (d) 0

10. The value of $\log_3 11. \log_{11} 13. \log_{13} 15. \log_{15} 27. \log_{27} 81 is$

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

11. If $|x + 2| \leq 9$, then x belongs to

(a) $(-\infty, -7)$ (b) [-11,7] (c) $(-\infty, -7) \cup [11, \infty)$ (d) (-11,7)

12. Given that x, y and b are real numbers $x < y, b > 0$, then

(a) $xb < yb$ (b) $xb > yb$ (c) $xb \leq yb$ (d) $\dfrac{x}{a} \geq \dfrac{y}{b}$

13. If $\log_{\sqrt{x}} 0.25 = 4$ then the value of x is

(a) 0.5 (b) 2.5 (c) 1.5 (d) 1.25

14. The value of $\log_a b \log_b c \log_c a$ is

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

15. If 3 is the logarithm of 343, then the base is

(a) 5 (b) 7 (c) 6 (d) 9

16. Find a so that the sum and product of the roots of the equation $2x^2 + (a-3)x + 3a - 5 = 0$ are equal is

(a) 1 (b) 2 (c) 0 (d) 4

17. If a and b are the roots of the equation $x^2 - kx + 16 = 0$ and satisfy $a^2 + b^2 = 32$, then the value of k is

(a) 10 (b) -8 (c) -8,8 (d) 6

18. The number of solutions of $x^2 + |x-1| = 1$ is

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

19. The equation whose roots are numerically equal but opposite in sign to the roots of $3x^2 - 5x - 7 = 0$ is

(a) $3x^2 - 5x - 7 = 0$ (b) $3x^2 + 5x - 7 = 0$ (c) $3x^2 - 5x + 7 = 0$ (d) $3x^2 + x - 7$

20. If 8 and 2 are the roots of $x^2 + ax + c = 0$ and $3, 3$ are the roots of $x^2 + dx + b = 0$, then the roots of the equation $x^2 + a + b = 0$ are

(a) 1,2 (b) -1,1 (c) 9,1 (d) -1,2