RK VISION ACADEMY

NEET | IIT – JEE | FOUNDATION

CBSE PRACTICE PAPER(2024)

(Mathematics)

Grade : XII **Marks: 40 marks**

Chapter: Relations & Functions Set-1 **Time: 90 minutes**

SECTION A

(This section comprises of Multiple-choice questions (MCQ) of 1 mark each.)

1. Consider the non-empty set consisting of children in a family and a relation R defined as aRb if a is brother of b. Then R is

   (A) symmetric but not transitive (B) transitive but not symmetric (C) neither symmetric nor transitive (D) both symmetric and transitive

2. Let f : [0, 1] → [0, 1] be defined by f (x) = $\begin{cases} x \ ; x \text{ is rational} \\ 1 - x \ ; s \text{ is irrational} \end{cases}$, Then (f o f) x is

   (A) constant (B) 1 + x (C) x (D) none of these

3. The maximum number of equivalence relations on the set A = {1, 2, 3} are

   (A) 1 (B) 2 (C) 3 (D) 5

4. Let f : [2, ∞) → R be the function defined by f (x) = $x^2 - 4x + 5$, then the range of f is

   (A) R (B) [1, ∞) (C) [4, ∞) (D) [5, ∞)

5. Let us define a relation R in R as aRb if a ≥ b. Then R is

   (A) an equivalence relation (B) reflexive, transitive but not symmetric (C) symmetric, transitive but not reflexive (D) neither transitive nor reflexive

6. Let f : N → R be the function defined by f (x) = $\frac{2x-1}{2}$ and g : Q → R be another function defined by g (x) 3

   (A) 2 (B) 1 (C) 72 (D) none of these

7. The identity element for the binary operation * defined on Q ~ {0} as a * b = 2 ab ∀ a, b ∈ Q ~ {0} is

   (A) 1 (B) 0 (C) 2 (D) none of these

8. Let f : R → R be defined by f(x)= $\begin{cases} 2x \ ; x > 3 \\ x^2 \ ; 1 < x \le 3 \\ 3x : x \le 1 \end{cases}$ Then

   f (– 1) + f (2) + f (4) is

   (A) 9 (B) 14 (C) 5 (D) none of these

9. Let A = {1, 2, 3, ...n} and B = {a, b}. Then the number of surjections from A into B is

   (A) $^nP_2$ (B) $2^n - 2$ (C) $2^n - 1$ (D) None of these

10. Let f : R → R be given by f (x) = tan x. Then f^{-1} (1) is

   (A) 4 π (B) {n π + 4 π : n ∈ Z} (C) does not exist (D) none of these

SECTION B

(This section comprises of very short answer type-questions (VSA) of 2 marks each.)

11. Let A = {a, b, c} and the relation R be defined on A as follows: R = {(a, a), (b, c), (a, b)}. Then, write minimum number of ordered pairs to be added in R to make R reflexive and transitive.

12. Let f , g : R → R be defined by f (x) = 2x + 1 and g (x) = $x^2 – 2$, ∀ x ∈ R, respectively. Then, find g o f.

13. Let f : R → R be the function defined by f (x) = 2x – 3 ∀ x ∈ R. write $f^{–1}$

SECTION C

(This section comprises of short answer type questions (SA) of 3 marks each)

14. Let A = {1, 2, 3, … 9} and R be the relation in A ×A defined by (a, b) R (c, d) if a + d = b + c for (a, b), (c, d) in A ×A. Prove that R is an equivalence relation and also obtain the equivalent class [(2, 5)].

15. Functions f , g : R → R are defined, respectively, **b**y f (x) = x^2 + 3x + 1, g (x) = 2x – 3, find (i) $f\ o\ g$ (ii) $g\ o\ f$ (iii) $f\ o\ f$

16. Using the definition, prove that the function f : A→ B is invertible if and only if f is both one-one and onto.

SECTION D

(This section comprises of long answer-type questions (LA) of 5 marks each)

17. If A = {1, 2, 3, 4 }, define relations on A which have properties of being:(a) reflexive, transitive but not symmetric(b) symmetric but neither reflexive nor transitive(c) reflexive, symmetric and transitive.

18. Let A = R – {3}, B = R – {1}. Let f : A → B be defined by f (x) = x – 2/ x – 3 ∀ x ∈ A . Then show that f is bijective.

19. An organization conducted bike race under 2 different categories-boys and girls. Totally there were 250 participants. Among all of them finally three from Category 1 and two from Category 2 were selected for the final race. Ravi forms two sets B and G with these participants for his college project. Let B = {b1,b2,b3} G={g1,g2} where B represents the set of boys selected and G the set of girls who were selected for the final race. Ravi decides to explore these sets for various types of relations and functions Ravi wishes to form all the relations possible from B to G.

1. How many such relations are possible?
 a. 2 6　　b. 2 5　　c. 0　　d. 2 3

2. Let R: B→B be defined by R = {(x, y): x and y are students of same sex}, Then this relation R is_______
 a. Equivalence　　b. Reflexive only　　c. Reflexive and symmetric but not transitive
 d. Reflexive and transitive but not symmetric

3. Ravi wants to know among those relations, how many functions can be formed from B to G?
 a. 2 2　　b. 2 12　　c. 3 2　　d. 2 3

4. Let $R: B \rightarrow G$ be defined by R = { (b1,g1), (b2,g2),(b3,g1)}, then R is__________
 a. Injective　　b. Surjective　　c. Neither Surjective nor Injective　　d. Surjective and Injective