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Atomic Energy Central School, Mysore

Session : 2025 - 26

Class: XII **Subject :Mathematics**

WORKSHEET NO : 1

Name of the Chapter : Relations and Functions

Name of the Topic: Relations and Functions **APRIL**

General Instructions:

Question number 1 to 10 are multiple choice questions, each of 1 mark

11 to 20 are VSAQ of 1 mark

21 to 30 are SAQ –I of 2 marks

31 to 35 are SAQ-II of 3 marks

36 to 40 are LAQ of 5 marks

1 Let f : R - {n}→ R be a function defined by $f(x) = \frac{x-m}{x-n}$, where m ≠ n. Then,

a) f is many one into

b) f is one - one onto

c) f is one - one into

d) f is many one onto

2 Let A = { 2 , 3 , 6 }. Which of the following relations on A are reflexive?

a) None of these

b) R_1 = {(2,2) , (3,3) , (6,6)}

c) R_2 = {(2,2) , (3,3) , (3,6) , (6,3)}

d) R_3 = {(2,2) , (3,6) , (2,6)}

3 Which of the followingis not an equivalence relation on Z?

a) a R b⇔ a - b is an even integer

b) a R b⇔ a +b is an even integer

c) a R b⇔ a b

d) a R b⇔ a =b

4 Let A = {a, b, c} and let R = {(a, a), (a, b), {b, a)}. Then, R

a) reflexive and symmetric but not transitive

b) an equivalence relation

c) symmetric and transitive but not reflexive

d) reflexive and transitive but not symmetric

5 Let f : Z→ Z be given by $f(x) = \begin{cases} \frac{x}{2}, if x is even \\ 0, if x is odd \end{cases}$. Then f is

a) onto but not one - one

b) neither one - one nor onto

c) one - one but not onto

d) one - one and onto

6 Let R = { (x,y): $x^2 + y^2 = 1$and x, y ∈ R } be a relation in R. The relation R is

a) symmetric

b) anti – symmetric

c) reflexive

d) transitive

7 Let A = {1, 2, 3} and consider the relation R = {1, 1), (2, 2), (3, 3), (1, 2), (2, 3), (1,3)}. Then R is

a) neither symmetric, nor transitive

b) symmetric and transitive

c) reflexive but not symmetric

d) reflexive but not transitive

8 The relation Rin N× N such that (a, b) R (c, d) ⇔ a + d = b + c is

a) reflexive and transitive but not symmetric

b) an equivalence relation

c) reflexive but symmetric

d) none of these

9 Let A = {1, 2, 3, 4, 5, 6}. Which of the following partitions of A correspond to an equivalence relation on A?

a) none of these

b) {1, 2, 3}, {3, 4, 5, 6}.

c) {1, 2, }, {3, 4}, {2, 3, 5, 6} d) {1, 3}, {2, 4, 5}, {6}

10 let A = R - (3) and B = R - 1 Then, f : A→ $B: f(x) = \frac{(x-2)}{(x-3)} is$

a) many - one and onto

b) many - one and into

c) one - one and onto

d) one - one and into

11. **Assertion (A):** A function f: Z → Z defined as f(x) = x^3 is injective.

Reason (R): A function f: A → B is said to be injective if every element of B has a pre - Image in A.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

12 **Assertion (A):** A function f: N → N be defined by

$f(n) = \begin{cases} \frac{n}{2} & if\ n\ is\ even \\ \frac{(n+1)}{2} & ifn\ is\ \ odd \end{cases}$ for all n ∈ N; is one - one.

Reason (R): A function f: A → B is said to be injective if a ≠ b thenf(a) ≠ f(b).

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

13 Show that the Signum function f :R→ R, given by $f(x) = \begin{cases} 1, if\ x\ > 0 \\ 0, if\ x = 0 \\ -1, if\ x\ < 0 \end{cases}$ is neither one - one nor onto.

14 Show that the function f : R→ R: f(x) = x ^{3} is one - one and onto

15 Let N be the set of all natural numbers and let R be a relation on N x N, defined by$(a, b)R(c, d) \Leftrightarrow ad = bc$ Show that R is an equivalence relation.

16 Show that the relation R in the set {1, 2 ,3} given by

R = {(1, 1), (2, 2), (3, 3), (1, 2), (2, 3)} is reflexive but neither symmetric nor transitive.

17 Let$f$: $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right] \to A$ be defined by f(x) = sin x. If f is a bijection, write set A.

18 Show that the function f : N→ N : f(x) = x ^{3} is one - one into

19 Let R be the relation on the set Z of all integers defined by (x, y)∈ R ⇒ x - y is divisible by nProve that:(x, y) ∈ R ⇒ (y, x) ∈ Rfor all x, y ∈ Z.

20 Let the function f : R→ R be defined by f(x) = 4x - 1, ∀ x ∈ R. Then, show that f is one - one.

21 Give an example of a relation which is reflexive and symmetric but not transitive.

22 f: R→ R be defined as f(x) = 3x, Check whether the function is one – one onto or other.

23 Prove that the function f :$R \to R$: $f(x) = x^2$ is neither one - one nor onto.

24 Let Z be the set of all integers and let R be a relation on Z defined by

R = { (a, b) / (a - b) is even } Show that R is an equivalence relation in Z.

25 Show that the function f : R→ R : f(x) = 3 - 4x is one - one onto and hence bijective.

26 Show that the function f : N→ Z, defined by $f(n) = \begin{cases} \frac{1}{2}(n-1), whennisodd \\ -\frac{1}{2}n, whenniseven \end{cases}$ is both one one and onto.

27 Let f :$N \to N$: $f(x) = 2x$ for all $x \in N$ show that f is one - one and into.

28 Let A ={1, 2, 3} and R = {(1,1), (2,2), (3,3), (1, 2), (2,3)}. Show that R is reflexive but neither symmetric nor transitive.

29 Let A = [–1, 1] Then, discuss whether the function defined on A by f(x) = $\frac{x}{2}$ is one - one, onto or bijective.

30 Let A = {1, 2, 3, 4} and R = {(1,1), (2,2), (3,3), (4,4), (1,2), (1,3), (3,2)}. Show that R is reflexive and transitive but not symmetric.

31 Let A and B be sets. Show that f : A× B → B × A such that f(a, b) = (b, a) is a bijective function.

32 If R is a relation defined on the set of natural numbers N as follows: R={(x,y) : x∈ N, y ∈ N and 2x+ y= 24}, then find the domain and range of the relation R. Also, find whether R is an equivalence relation or not.

33 Check if the relation R defined in the set {1, 2, 3, 4, 5, 6} as R = {(a, b): b = a+1} is reflexive, symmetric or transitive.

34 State whether the function is one – one, onto or bijective f: R to R defined by f(x) = 3 – 4x

35 Show that a function f: R→ R given by f(x) = ax + b, a, b ∈ R, a ≠ 0 is a bijective.

36 Let n be a fixed positive integer. Define a relation R in Z as follows∀ a, b ∈ Z aRb if and only if a - b is divisible by n. Show that R is an equivalence relation.

37 If f :R → R be defined by f(x) = 3x-2 and g:R→R be defined by g(x) = $\frac{x+2}{3}$.

Determine (i) f+g (ii)f-g (iii) f.g (iv) $\frac{f}{g}$

38 Let R be a relation on $N \times N$, defined by (a, b) R (c, d) ⇔ a + d = b + c for all (a, b), (c, d) ∈ $N \times N$ .Show that R is an equivalence relation.

39 Let A = R – {3} and B = R – {1}. Consider the function f: A→ B defined by $f(x) = \left(\frac{x-2}{x-3}\right)$. Is f one - one and onto? Justify your answer.

40 **Read the case study carefully and answer the questions that follow:** 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 = $\{b_1, b_2, b_3\}$ G = $\{g_1, g_2\}$ 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. Based on the information given above, answer the following questions:

1. Ravi wishes to form all the relations possible from B to G. 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→ G be defined by R = {(b_1 , g_1), (b_2 , g_2), (b_3 , g_1)}, then R is ________.

   a. Injective

   b. Surjective

   c. Neither Surjective nor Injective

   d. Surjective and Injective

5. Ravi wants to find the number of injective functions from B to G. How many numbers of injective functions are possible?

   a. 0

   b. 2!

   c. 3!

   d. 0!