SEEMAX INTERNATIONAL SCHOOL

SESSION-2024-25

Worksheet Name: Relation & Functions | **Standard: 12th Science** | **Subject: Mathematics**

Q1. Show that the relation R on defined as $\mathrm{R} = \{(\mathrm{a}, \mathrm{b}) : \mathrm{a} \leq \mathrm{b}\}$, is reflexive, and transitive but not symmetric.

Q2. Let Z be the set of all integers and R be the relation on Z defined as R = {(a, b): a, b ∈ Z, and (a – b) is divisible by 5.} Prove that R is an equivalence relation.

Q3. Let A = IR – {3} and B = IR – {1}. Consider the function f: A $\rightarrow$ B defined by $\mathrm{f}(\mathrm{x}) = \left(\frac{\mathrm{x}-2}{\mathrm{x}-3}\right)$. Show that fis one-one and onto and hence find f^{-1}.

Q4. Show that the function f in $\mathrm{A} = |\mathrm{R} - \left\{\frac{2}{3}\right\}$ defined as $\mathrm{f}(\mathrm{x}) = \frac{4\mathrm{x}+3}{6\mathrm{x}-4}$ is one-one and onto. Hence find f^{-1}.

Q5. Prove that the function f : N → N, defined by $f(x) = x^2 + x + 1$ is one-one but not onto. Find inverse of f : N → S, where S is range of f.

Q6. Show that the relation R defined by (a, b) R (c, d) ⇒ a + d = b + c on the set N × N is an equivalence relation.

Q7. Show that the relation S in the set A = {x ∈ Z : 0 ≤ x ≤ 12} given by S = {(a, b): a, b ∈ Z, | a – b | is divisible by 4} is an equivalence relation. Find the set of all elements related to 1.

Q8. Prove that the relation R on Z, defined by R {(x, y) : (x – y) is divisible by 5} is an equivalence relation.

Q9. Prove that the relation R in the set $\mathrm{A} = (1, 2, 3, 4, 5)$ given by $\mathrm{R} = (\mathrm{a}, \mathrm{b}) : |\mathrm{a}\text{-}\mathrm{b}| \mathrm{is\ even},$ is an equivalence relation.

Q10. Show that the relation R in the set A = {1, 2, 3, 4, 5, 6} given by R = {(a, b): |a – b| is divisible by 2} is an equivalence relation.

Q11. Let A = {1, 2, 3,....., 9} and R be the relation in A x A defined by (a, b) R (c, d) if a + d = b + c for (a, b), (c, d) in A x A. Prove that R is an equivalence relation. Also obtain the equivalence class [(2,5)]

Q12. Check whether the relation R in the set N of natural numbers given by R = {(a, b) : a is divisor of b} is reflexive, symmetric or transitive. Also determine whether R is an equivalence relation.

Q13. Let N be the set of natural numbers and R be the relation on N × N defined by (a, b) R (c, d) iff ad = bc for all a, b, c, d ∈ N. Show that R is an equivalence relation.

Q14. Show that the function $\mathrm{f} : (-\infty, 0) \rightarrow (-1, 0)$ defined by $\mathrm{f}(\mathrm{x}) = \frac{\mathrm{x}}{1+|\mathrm{x}|}, \mathrm{x} \in (-\infty, 0)$ is one one and onto.

Q15. Check if the relation R in the set of real numbers defined as R = {(a, b) : a < b} is (i) symmetric, (ii) transitive.

Q16. If $\mathrm{f}(\mathrm{x}) = \frac{4\mathrm{x}+3}{6\mathrm{x}-4}, \mathrm{x} \neq \frac{2}{3}$, then show that (fof) (x) = x, for all $\mathrm{x} \neq \frac{2}{3}$. Also, write inverse of f.

Q17. Check if the relation R on the set A = {1, 2, 3, 4, 5, 6} defined as R = {(x, y) : y is divisible by x} is (i) symmetric (ii) transitive.

Q18. The function f : R→[– 1, 1] defined by $\mathrm{f}(\mathrm{x}) = \cos \mathrm{x}$ is

A Both one-one and onto. **B** Not one-one, but onto. **C** One-one, but not onto. **D** Neither one-one, nor onto.

Q19. State the reason for the relation R in the set {1, 2, 3} given by R = {(1, 2), (2, 1)} not to be transitive.

Q20. Let A = {1, 2, 3}, B = {4, 5, 6, 7} and let f = {(1, 4), (2, 5), (3, 6)} be a function from A to B. State whether f is one-one or not.

Q21. Let A = {1, 3, 5}. Then the number of equivalence relations in A containing (1, 3) is:

A 1 **B** 2 **C** 3 **D** 4