1 Mark Questions

1. If $R = \{(a, a^3) : a$ is a prime number less than 5$\}$ be a relation. Find the range of R.

   Foreign 2014

2. If $f: \{1,3,4\} \to \{1,2,5\}$ and $g : \{1,2,5\} \to \{1,3\}$ given by $f = \{(1,2), (3,5), (4,1)\}$ and $g = \{(1,3), (2,3), (5,1)\}$. Write down gof.

   All India 2014C

3. Let R is the equivalence relation in the set $A = \{0,1,2,3,4,5\}$ given by $R = \{(a,b): 2$ divides $(a - b)\}$. Write the equivalence class $[0]$.

   Delhi 2014C

4. If $R = \{(x, y) : x + 2y = 8\}$ is a relation on N, then write the range of R.   **All India 2014**

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

All India 2011

6. If $f : R \to R$ is defined by $f(x) = 3x + 2$, then define $f[f(x)]$.

Foreign 2011; Delhi 2010

7. Write fog, if $f : R \to R$ and $g : R \to R$ are given by $f(x) = |x|$ and $g(x) = |5x - 2|$.

Foreign 2011

8. Write fog, if $f : R \to R$ and $g : R \to R$ are given by $f(x) = 8x^3$ and $g(x) = x^{1/3}$.

Foreign 2011

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

Delhi 2011

10. What is the range of the function

$$f(x) = \frac{|x - 1|}{x - 1}, x \neq 1 ?$$

Delhi 2010; HOTS

11. If $f : R \to R$ is defined by $f(x) = (3 - x^3)^{1/3}$, then find $fof(x)$.

All India 2010

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12. If f is an invertible function, defined as

$f(x) = \dfrac{3x - 4}{5}$, then write $f^{-1}(x)$.

13. If $f : R \to R$ and $g : R \to R$ are given by

$f(x) = \sin x$ and $g(x) = 5x^2$, then find $gof(x)$.

14. If $f(x) = 27x^3$ and $g(x) = x^{1/3}$, then find $gof(x)$.

15. If the function $f : R \to R$, defined by

$f(x) = 3x - 4$ is invertible, then find f^{-1}.

16. If $f : R \to R$ defined by $f(x) = \dfrac{3x + 5}{2}$ is an

invertible function, then find $f^{-1}(x)$

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17. State whether the function $f : N \to N$ given by

$f(x) = 5x$ is injective, surjective or both.

18. If $f : R \rightarrow R$ defined by $f(x) = \dfrac{2x - 7}{4}$ is an invertible function, then find $f^{-1}(x)$.

4 Marks Questions

19. If $f: W \rightarrow W$, is defined as $f(x) = x - 1$, if x is odd and $f(x) = x + 1$, if x is even. Show that f is invertible. Find the inverse of f, where W is the set of all whole numbers.

20. If $f,g : R \rightarrow R$ are two functions defined as $f(x) = |x| + x$ and $g(x) = |x| - x, \forall \, x \in R$, Then, find fog and gof.

21. If R is a relation defined on the set of natural numbers N as follows:

$R = \{(x,y), x \in N, Y \in N \text{ and } 2x + y = 24\}$, then find the domain and range of the relation R. Also, find if R is an equivalence relation or not.

22. If $A = R - \{3\}$ and $B = R - \{1\}$. Consider the function $f : A \rightarrow B$ defined by $f(x) = \dfrac{x-2}{x-3}$ for all $x \in A$. Then show that f is bijective. Find $f^{-1}(x)$. **Delhi 2014C; Delhi 2012**

23. If $A = \{1, 2, 3, \dots , 9\}$ and R be the relation in $A \times A$ defined by $(a , b)\, R\, (c , d)$. If $a + d = b + c$ for $(a , b), (c , d)$ in $A \times A$. Prove that R is an equivalence relation, Also, obtain the equivalence class $[(2, 5)]$. **Delhi 2014**

24. If the function $f : R \longrightarrow R$ is given by $f(x) = x^2 + 2$ and $g : R \rightarrow R$ is given by $g(x) = \dfrac{x}{x-1}$; $x \neq 1$, then find fog and gof and hence, find $fog\,(2)$ and $gof\,(-3)$. **All India 2014**

25. If $A = R - \{2\}$ and $B = R - \{1\}$. If $f : A \rightarrow B$ is a function defined by $f(x) = \dfrac{x-1}{x-2}$, then show that f is one-one and onto. Hence, find f^{-1}. **Delhi 2013C**

26. Show that the function f in

$$A = R - \left\{\frac{2}{3}\right\} \text{ defined as } f(x) = \frac{4x+3}{6x-4} \text{ is}$$

one-one and onto. Hence, find f^{-1}. **Delhi 2013**

27. Consider $f : R_+ \to [4, \infty)$ given by $f(x) = x^2 + 4$. Show that f is invertible with the inverse f^{-1} of f given by $f^{-1}(y) = \sqrt{y-4}$, where R_+ is the set of all non-negative real numbers.

All India 2013; Foreign 2011; HOTS

28. Show that $f : N \to N$, given by

$$f(x) = \begin{cases} x+1, & \text{if } x \text{ is odd} \\ x-1, & \text{if } x \text{ is even} \end{cases}$$

is bijective (both one-one and onto).

All India 2012

29. If $f : R \to R$ is defined as $f(x) = 10x + 7$. Find the function $g : R \to R$, such that $gof = fog = I_R$. **All India 2011**

30. Show that the function $f : W \to W$ defined by

$$f(n) = \begin{cases} n+1, & \text{if } n \text{ is even} \\ n-1, & \text{if } n \text{ is odd} \end{cases}$$

is a bijective function. **All India 2011C**

31. If $f : R \rightarrow R$ is the function defined by $f(x) = 4x^3 + 7$, then show that f is a bijection.

Delhi 2011C

32. If Z is the set of all integers and R is the relation on Z defined as $R = \{(a, b) : a, b \in Z$ and $a - b$ is divisible by 5$\}$. Prove that R is an equivalence relation.

Delhi 2010; HOTS

33. Show that the relation S in the set R of real numbers defined as, $S = \{(a \ b) : a, b \in R$ and $a \leq b^3\}$ is neither reflexive nor symmetric nor transitive.

Delhi 2010; HOTS

34. Show that the relation S in set $A = \{x \in Z : 0 \leq x \leq 12\}$ given by $S = \{(a, b) : a, b \in Z, |a - b|$ is divisible by 4$\}$ is an equivalence relation. Find the set of all elements related to A.

All India 2010

35. Show that the relation S defined on set $N \times N$ by $(a, b) \, S \, (c, d) \Rightarrow a + d = b + c$ is an equivalence relation.

All India 2010

36. Consider $f : R_+ \to [-5, \infty)$ given by $f(x) = 9x^2 + 6x - 5$, show that f is invertible with $f^{-1}(y) = \left(\dfrac{\sqrt{y + 6} - 1}{3} \right)$. **Foreign 2010**

37. If $f : X \to Y$ is a function. Define a relation R on X given by $R = \{(a, b) : f(a) = f(b)\}$. Show that R is an equivalence relation on X. **All India 2010C**

38. Show that a function $f : R \to R$ given by $f(x) = ax + b, a, b \in R, a \neq 0$ is a bijective. **Delhi 2010C**

39. Prove that the relation R in set $A = \{1, 2, 3, 4, 5\}$ given by $R = \{(a, b) : |a - b| \text{ is even}\}$ is an equivalence relation. **Delhi 2009**

40. If $f : N \to N$ is defined by

$$f(n) = \begin{cases} \dfrac{n + 1}{2}, & \text{if } n \text{ is odd} \\ \dfrac{n}{2}, & \text{if } n \text{ is even} \end{cases} \quad \text{for all } n \in N.$$

Find whether the function f is bijective. **All India 2009**

41. Show that relation R in the set of real numbers, defined as $R = \{(a, b) : a \le b^2\}$ is neither reflexive, nor symmetric nor transitive.

42. If the function $f : R \to R$ is given by $f(x) = x^2 + 3x + 1$ and $g : R \to R$ is given by $g(x) = 2x - 3$, then find (i) fog and (ii) gof.

43. If the function $f : R \to R$ is given by $f(x) = \dfrac{x + 3}{3}$ and $g : R \to R$ is given by $g(x) = 2x - 3$, then find

(i) fog and   (ii) gof. Is $f^{-1} = g$?