

## ASSIGNMENT

### CLASS XI RELATIONS AND FUNCTIONS

**Q1.**  $A$  and  $B$  are two sets given in such a way that  $A \times B$  contains 6 elements. If three elements of  $A \times B$  be  $(1,3), (2,5)$  and  $(3,3)$ , find its remaining elements.

**Q2.** If  $A = \{x : x^2 - 5x + 6 = 0, x \in N\}$ ,  $B = \{x : 0 \leq x < 2, x \in W\}$  and  $C = \{x : x < 3, x \in N\}$ , then verify:

$$(i) A \times (B \cup C) = (A \times B) \cup (A \times C)$$

$$(ii) A \times (B \cap C) = (A \times B) \cap (A \times C)$$

$$(iii) (A - B) \times C = (A \times C) - (B \times C)$$

$$(iv) (A \cap B) \times C = (A \times C) \cap (B \times C)$$

**Q3.** Let  $A = \{2, 3, 5, 7\}$  and  $B = \{3, 5, 9, 13, 15\}$ . Let  $f = \{(x, y) : x \in A, y \in B \text{ and } y = 2x - 1\}$ .

Write  $f$  in the roster form. Show that  $f$  is a function from  $A$  to  $B$ . Find the domain and range of  $f$ .

**Q4.** Let  $R = \{(x, y) : x, y \in Z, y = 2x - 4\}$ . If  $(a, -2)$  and  $(4, b^2)$  belongs to  $R$ , find the values of  $a$  and  $b$ .

**Q5.** Let  $A$  be set of first ten natural numbers and  $R$  be a relation on  $A$  given by  $(x, y) \in R \Leftrightarrow x + 2y = 10$  i.e.  $R = \{(x, y) : x \in A \text{ and } y \in B \text{ and } x + 2y = 10\}$ . Write  $R$  as set of ordered pairs.

**Q6.** A relation  $R$  is defined on the set  $Z$  of integers as follows:  $(x, y) \in R \Leftrightarrow x^2 + y^2 = 25$ . Express  $R$  as the set of ordered pairs.

**Q7.** If  $f(x) = x^2 - 3x + 1$ , find  $x \in R$  such that  $f(2x) = f(x)$ .

**Q8.** If  $f : R \rightarrow R$  is defined by  $f(x) = \frac{x}{x^2 + 1}$ , find  $f(f(2))$ .

**Q9.** Find the domain for which the function  $f(x) = 2x^2 - 1$  and  $g(x) = 1 - 3x$  are equal?

**Q10.** Find the domain and the range of the following functions:

$$(a) f(x) = \frac{1}{x-3} \quad (b) f(x) = \frac{1}{1-x^2} \quad (c) f(x) = \sqrt{(x-1)(3-x)} \quad (d) f(x) = \frac{x-2}{3-x}$$

$$(e) f(x) = \frac{1}{\sqrt{x-5}} \quad (f) f(x) = \frac{3}{2-x^2} \quad (g) f(x) = \frac{4-x}{x-4} \quad (h) f(x) = 11 - 7 \sin x$$

**Q11.** If  $R = \{(x, y) : x, y \in Z, x^2 + y^2 \leq 4\}$  is a relation defined on  $Z$ . Write domain of  $R$ .

**Q12.** Let  $A = \{1, 2, 3\}$  and  $R = \{(a, b) : |a^2 - b^2| \leq 5; a, b \in A\}$ . Write  $R$  as set of ordered pairs.

**Q13.** Let  $A = \{1, 2, 3, 5\}$ ,  $B = \{4, 6, 9\}$  and  $R$  be a relation from  $A$  to  $B$  defined by

$R = \{(x, y) : x - y \text{ is odd}\}$ . Write  $R$  in a roster form.

**Q14.** Find the domain and range of the following relations:

(a)  $R = \{(-1,1), (1,1), (2,4), (-2,4), (3,9)\}$       (b)  $R = \left\{ \left( x, \frac{1}{x} \right) : x \text{ is an integer, } 0 < x < 6 \right\}$   
 (c)  $R = \{(x, y) : x \text{ and } y \text{ are integers and } xy = 4\}$       (d)  $R = \left\{ (x, y) : y = x + \frac{6}{x}; x, y \in N \text{ and } x < 6 \right\}$

**Q15.** A function  $f$  is defined as  $f(x) = \begin{cases} x^2 & ; x < 0 \\ x & ; 0 < x \leq 1. \\ \frac{1}{x} & ; x > 1 \end{cases}$

Find:  $f(-2), f(1), f(\sqrt{2}), f(-\sqrt{3})$  and  $f\left(\frac{4}{3}\right)$ .

**Q16.** Redefine the function  $f(x) = |x-2| + |2+x|; -3 \leq x \leq 3$ .

**Q17.**  $f\left(x + \frac{1}{x}\right) = x^2 + \frac{1}{x^2}$ ,  $x \neq 0$ , prove that  $f(x) = x^2 - 2$ .

**Q18.** If  $f(x) = \frac{1}{2x+1}$ ,  $x \neq -\frac{1}{2}$ , then show that  $f(f(x)) = \frac{2x+1}{2x+3}$  provided that  $x \neq -\frac{3}{2}$ .

**Q19.** If  $f(x) = x^2 - 3x + 4$ , then find the values of  $x$  satisfying the equation  $f(x) = f(2x+1)$ .

**Q20.** If  $f(x) = \frac{4^x}{4^x + 2}$ , show that  $f(x) + f(1-x) = 1$ .

**Q21.** Find range of the following functions:

(a)  $f(x) = \frac{x}{|x|}$       (b)  $f(x) = \frac{x+2}{|x+2|}; x \neq -2$       (c)  $f(x) = \frac{x^2+x+2}{x^2+x+1}$       (d)  $f(x) = {}^{7-x}P_{x-3}$

**Q22.** Find domain and range of:

(a)  $f(x) = \frac{1}{2 - \sin 3x}$       (b)  $f(x) = \frac{x^2-1}{x-1}; x \in R, x \neq 1$

**Q23.** Draw the graph of the following functions:

(a)  $y-3 = (x+2)^2$       (b)  $y = |x-4| - 3$       (c)  $y = \sqrt{16-x^2}$       (d)  $y = [x-1]$

### **ANSWERS (RELATIONS AND FUNCTIONS)**

1.  $(1,5), (2,3)$  and  $(3,5)$       3.  $f = \{(2,3), (3,5), (5,9), (7,13)\}$ ,  $\text{dom}(f) = \{2,3,5,7\}$ ,  $\text{range}(f) = \{3,5,9,13\}$

4.  $a=1, b=\pm 2$       5.  $R = \{(2,4), (4,3), (6,2), (8,1)\}$

6.  $R = \{(0,5), (0,-5), (3,4), (-3,4), (3,-4), (-3,-4), (4,3), (-4,3), (4,-3), (-4,-3), (5,0), (-5,0)\}$

7.  $x=0,1$       8.  $\frac{10}{29}$       9.  $\left\{-2, \frac{1}{2}\right\}$

10. (a)  $\text{dom}(f) = R - \{3\}$ ,  $\text{range}(f) = R - \{0\}$       (b)  $\text{dom}(f) = R - \{-1,1\}$ ,  $\text{range}(f) = (-\infty, 0) \cup [1, \infty)$

(c)  $\text{dom}(f) = [1,3]$ ,  $\text{range}(f) = [0,1]$       (d)  $\text{dom}(f) = R - \{3\}$ ,  $\text{range}(f) = R - \{-1\}$

(e)  $\text{dom}(f) = (5, \infty)$ ,  $\text{range}(f) = (0, \infty)$       (f)  $\text{dom}(f) = R - \{-\sqrt{2}, \sqrt{2}\}$ ,  $\text{range}(f) = (-\infty, 0) \cup \left[\frac{3}{2}, \infty\right)$

(g)  $\text{dom}(f) = R - \{4\}$ ,  $\text{range}(f) = \{-1\}$       (h)  $\text{dom}(f) = R$ ,  $\text{range}(f) = [4,18]$

11.  $\{-2, -1, 0, 1, 2\}$       12.  $\{(1,1), (2,2), (3,3), (1,2), (2,1), (2,3), (3,2)\}$

13.  $R = \{(1,4), (1,6), (2,9), (3,4), (3,6), (5,4), (5,6)\}$

14. (a)  $D_f = \{-2, -1, 1, 2, 3\}$ ,  $R_f = \{1, 4, 9\}$       (b)  $D_f = \{1, 2, 3, 4, 5\}$ ,  $R_f = \left\{1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}\right\}$

(c)  $D_f = \{-4, -2, -1, 1, 2, 4\} = R_f$       (d)  $D_f = \{1, 2, 3, 4\}$ ,  $R_f = \{5, 7\}$

15.  $4, 1, \frac{1}{\sqrt{2}}, 3, \frac{3}{4}$

16.  $f(x) = \begin{cases} -2x & ; -3 \leq x < -2 \\ 4 & ; -2 \leq x < 2 \\ 2x & ; 2 \leq x \leq 3 \end{cases}$

19.  $x = -1, \frac{2}{3}$

21. (a)  $\{-1,1\}$       (b)  $\{-1,1\}$

(c)  $\left[1, \frac{7}{3}\right]$       (d)  $\{1, 2, 3\}$

22. (a)  $D_f = R$ ,  $R_f = \left[\frac{1}{3}, 1\right]$       (b)  $D_f = R - \{1\}$ ,  $R_f = R - \{2\}$

