

Maxprep. Chapter wise Series Class 11th - Relation and Function

Class : 11th

Subject: Mathematics

Max. Marks : 50

Duration : 2 Hrs

Sections: A (MCQs), B (Short Answer-I), C (Short Answer-II), D (Long Answer), E (Case-Based).

General Instructions:

- (i). All questions are compulsory.
- (ii). This question paper contains 23 questions divided into five Sections A, B, C, D and E. (iii). Section A comprises of 10 MCQs of 1 mark each. Section B comprises of 5 questions of 2 marks each. Section C comprises of 4 questions of 3 marks each. Section D comprises of 2 question of 5 marks each and Section E comprises of 2 Case Study Based Questions of 4 marks each.
- (iv). There is no overall choice.
- (v). Use of Calculators is not permitted.

Section A

Questions 1 to 10 carry 1 mark each

1. The domain of the function f given by $f(x) = \frac{x^2+2x+1}{x^2-x-6}$
a) $R - (-3, -2)$ b) $R - \{-2, 3\}$ c) $R - [3, -2]$ d) $R - \{-3, 2\}$
2. If R is a relation on set $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ given by $x R y \Leftrightarrow y = 3x$, then $R =$
a) $\{(3, 1), (6, 2), (9, 3)\}$ b) none of these
c) $\{(3, 1), (2, 6), (3, 9)\}$ d) $\{(3, 1), (6, 2), (8, 2), (9, 3)\}$
3. A relation R is defined from $\{2, 3, 4, 5\}$ to $\{3, 6, 7, 10\}$ by $x R y \Leftrightarrow x$ is relatively prime to y . Then, domain of R is
a) $\{2, 3, 5\}$ b) $\{3, 5\}$ c) $\{2, 3, 4, 5\}$ d) $\{2, 3, 4\}$
4. The domain and range of the real function f defined by $f(x) = \frac{4-x}{x-4}$ is given by
a) Domain = $R - \{1\}$, Range = R b) Clearly, Domain = $R - \{-4\}$, Range = $\{-1, 1\}$
c) Domain = $R - \{4\}$, Range = $\{-1\}$ d) Domain = R , Range = $\{-1, 1\}$
5. The function $f(x) = 10^x$ from R to $[0, \infty)$ is
a) a constant function b) an identity function
c) one – one and into d) one – one and onto
6. The domain of definition of the function $f(x) = \sqrt{x-1} + \sqrt{3-x}$ is
a) $(1, 3)$ b) $(-\infty, 3)$ c) $[1, \infty)$ d) $[1, 3]$
7. R is a relation from $\{11, 12, 13\}$ to $\{8, 10, 12\}$ defined by $y = x - 3$. Then, R^{-1} is
a) $\{(11,8), (13,10)\}$ b) $\{(10,13), (12,10)\}$
c) $\{(8,11), (10,13)\}$ d) $\{(10,13), (8,11), (12,10)\}$

8. If $A = \{1, 2, 4\}$, $B = \{2, 4, 5\}$, $C = \{2, 5\}$, then $(A - B) \times (B - C)$ is
 a) $(1, 4)$ b) $(2, 5)$ c) $\{(1, 4)\}$ d) $\{(1, 2), (1, 5), (2, 5)\}$

Assertion(A)/Reason(R) Based (9-10): In the following questions, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

- 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.

9. Assertion (A): If $f : \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = \frac{1}{x} \forall x \in \mathbb{R}$. Then f is not defined.

Reason (R): This function does not exist for every value of the domain.

10. Assertion (A): Domain and Range of a relation $R = \{(x, y) : x - 3y = 0\}$ defined on the set $A = \{1, 2, 3\}$ are respectively $\{1, 2, 3\}$ and $\{2, 4, 6\}$.

Reason (R): Domain and Range of a relation R are respectively the sets $\{a : a \in A \text{ and } (a, b) \in R\}$ and $\{b : b \in A \text{ and } (a, b) \in R\}$.

SECTION – B

Questions 11 to 15 carry 2 marks each

11. If $y = f(x) = \frac{ax-b}{bx-a}$ and $a^2 \neq b^2$ then show that $x = f(y)$.
12. 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 roster form. Show that f is a function from A to B. Find the domain and range of f.
13. Find the domain and range of the real functions $f(x) = \sqrt{x^2 + 4}$
14. Given $A = \{1, 2, 3\}$, $B = \{3, 4\}$, $C = \{4, 5, 6\}$, find $(A \times B) \cap (B \times C)$.
15. If $f(x) = (a - x^n)^{1/n}$, $a > 0$ and $n \in \mathbb{N}$. Prove that $f(f(x)) = x$ for all x.

SECTION – C

Questions 16 to 19 carry 3 marks each

16. Find the domain and range of the real function: $f(x) = \sqrt{9 - x^2}$
17. If $f(x) = 3x^4 - 5x^2 + 9$ find $f(x-1)$.
18. If $A \subseteq B$, then prove that $A \times A = (A \times B) \cap (B \times A)$.
19. Let $A = \{0, 1, 2\}$ and $B = \{3, 5, 7, 9\}$. Let $f = \{(x, y) : x \in A, y \in B \text{ and } y = 2x + 3\}$.

Write f as a set of ordered pairs. Show that f is a function from A to B . Find $\text{dom}(f)$ and $\text{range}(f)$.

SECTION – D

Questions 20 to 21 carry 5 marks each

20. If $A = \{a, d\}$, $B = \{b, c, e\}$ and $C = \{b, c, f\}$, then verify that

a) $A \times (B \cup C) = (A \times B) \cup (A \times C)$ b) $A \times (B \cap C) = (A \times B) \cap (A \times C)$

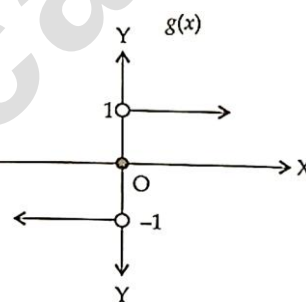
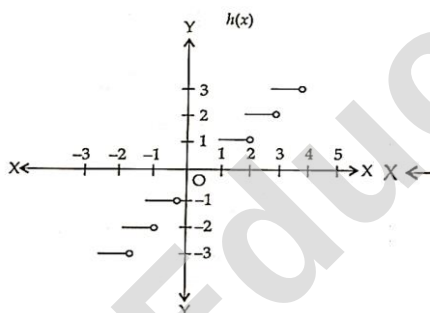
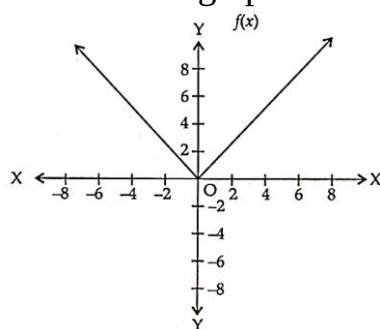
21. Show that the function $f : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = \frac{x}{x^2+1}$, $\forall x \in \mathbb{R}$, is neither one – one nor onto.

SECTION – E (Case Study Based Questions)

Questions 22 & 23 carry 4 marks each

22. Read the following text carefully and answer the questions that follow:

Consider the graphs of the functions $f(x)$, $h(x)$ and $g(x)$.



- a) Find the range of $h(x)$. (1)
 b) Find the domain of $f(x)$. (1)
 c) Find the value of $f(10)$. (2)

OR

Find the range of $g(x)$. (2)

23. Read the following text carefully and answer the questions that follow:

Ordered Pairs The ordered pair of two elements a and b is denoted by (a, b) : a is first element (or first component) and b is second element (or second component).

Two ordered pairs are equal if their corresponding elements are equal. i.e. $(a, b) = (c, d) \Rightarrow a = c$ and $b = d$

Cartesian Product of Two Sets For two non – empty sets A and B , the Cartesian product $A \times B$ is the set of all ordered pairs of elements from sets A and B . In symbolic form, it can be written as $A \times B = \{(a, b) : a \in A, b \in B\}$

- a) Let A and B be two sets such that $A \times B$ consists of 6 elements. If three elements of $A \times B$ are $(1, 4)$, $(2, 6)$ and $(3, 6)$, then find $A \times B$ and $B \times A$. (1)
 b) If $(x + 2, 4) = (5, 2x + y)$, then find the value of x and y . (1)
 c) If $(x + 6, y - 2) = (0, 6)$, then find the value of x and y . (2)

OR

If $(a - 3, b + 7) = (3, 7)$, then find the value of a and b . (2)

Relation and Function Paper Details – Analysis		
Objective Questions		
MCQ	1 marks x 8 question = 8	
Assertion Reason	1 marks x 2 question = 2	
Subjective		
Short type I	2 marks x 5 question = 10	
Short type II	3 marks x 4 question = 12	
Long Type	5 marks x 2 question = 10	
Case Studies Based		
Case 1	4 marks	
Case 2	4 marks	

Total = 50 marks Your Score =