



Vidyarohi
Learning

CBSE Class 12

Relations and Functions

Previous Year

Questions

Question PDF

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Relations and Functions

Q.No.1:

What is the range of the function $f(x) = \frac{|x-1|}{(x-1)}$?

CBSE Board Paper 2010

Q.No.2:

Let $*$ be a binary operation on \mathbb{Q} defined by

$$a * b = \frac{3ab}{5}$$

Show that $*$ is commutative as well as associative. Also find its identity element, if it exists.

CBSE Board Paper 2010

Q.No.3:

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

CBSE Board Paper 2011

Q.No.4:

Consider the binary operation $*$ on the set $\{1, 2, 3, 4, 5\}$ defined by $a * b = \min. \{a, b\}$. Write the operation table of the operation $*$.

CBSE Board Paper 2011

Q.No.5:

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

Hence find f^{-1} .

CBSE Board Paper 2013

Q.No.6:

Let $*$ be a 'binary' operation on \mathbf{N} given by $a * b = \text{LCM}(a, b)$ for all $a, b \in \mathbf{N}$. Find $5 * 7$.

CBSE Board Paper 2012

Q.No.7:

Let $A = \mathbf{R} - \{3\}$ and $B = \mathbf{R} - \{1\}$. Consider the function $f : A \rightarrow B$ defined by

$$f(x) = \left(\frac{x-2}{x-3} \right).$$

Show that is one-one and onto and hence find f^{-1} .

CBSE Board Paper 2012

Q.No.8: Let $*$ be a binary operation, on the set of all non-zero real numbers, given by $a * b = \frac{ab}{5}$ for all $a, b \in \mathbf{R} - \{0\}$. Find the value of x , given that $2 * (x * 5) = 10$.

CBSE Board Paper 2014

Q.No.9: Let $A = \{1, 2, 3, \dots, 9\}$ 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 $[(2, 5)]$.

CBSE Board Paper 2014

Q.No.10: Let \mathbf{N} denote the set of all natural numbers and R be the relation on $\mathbf{N} \times \mathbf{N}$ defined by $(a, b) R (c, d)$ if $ad(b + c) = bc(a + d)$. Show that R is an equivalence relation.

CBSE Board Paper 2015

Q.No.11: Let $f : \mathbf{N} \rightarrow \mathbf{N}$ be a function defined as $f(x) = 9x^2 + 6x - 5$. Show that $f : \mathbf{N} \rightarrow S$, where S is the range of f , is invertible. Find the inverse of f and hence find $f^{-1}(43)$ and $f^{-1}(163)$.

CBSE Board Paper 2016

Q.No.12: Consider $f : \mathbf{R}_+ \rightarrow [-5, \infty)$, given by $f(x) = 9x^2 + 6x - 5$. Show that f is invertible with $f^{-1}(y) = \left(\frac{\sqrt{y+6}-1}{3} \right)$.

Hence Find

(i) $f^{-1}(10)$

(ii) y if $f^{-1}(y) = \frac{4}{3}$,

where \mathbf{R}_+ is the set of all non-negative real numbers.

OR

Discuss the commutativity and associativity of binary operation '*' defined on $A = \mathbb{Q} - \{1\}$ by the rule $a * b = a - b + ab$ for all, $a, b \in A$. Also find the identity element of * in A and hence find the invertible elements of A.

CBSE Board Paper 2017

Q.No.13: If $a * b$ denotes the larger of 'a' and 'b' and if $a \circ b = (a * b) + 3$, then write the value of $(5) \circ (10)$, where * and \circ are binary operations.

CBSE Board Paper 2018

Q.No.14: Let $A = \{x \in \mathbb{Z} : 0 \leq x \leq 12\}$. Show that $R = \{(a, b) : a, b \in A, |a - b| \text{ is divisible by } 4\}$ is an equivalence relation. Find the set of all elements related to 1. Also write the equivalence class [2].

OR

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. Also, if $g : \mathbb{R} \rightarrow \mathbb{R}$ is defined as $g(x) = 2x - 1$, find $f \circ g(x)$.

CBSE Board Paper 2018

Q.No.15: Show that the relation R on \mathbb{R} defined as $R = \{(a, b) : a \leq b\}$, is reflexive, and transitive but not symmetric.

OR

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

CBSE Board Paper 2019

Q.No.16: Examine whether the operation * defined on R by $a * b = ab + 1$ is (i) a binary or not. (ii) if a binary operation, is it associative or not ?

CBSE Board Paper 2019

Q.No.17: Fill in the blank.

The least value of the function $f(x) = ax + \frac{b}{x} (a > 0, b > 0, x > 0)$ is

_____.

CBSE Board Paper 2020

Q.No.18: Fill in the blank.

A relation in a set A is called _____ relation, if each element of A is related to itself.

CBSE Board Paper 2020

Q.No.19: Check if the relation R in the set \mathbb{R} of real numbers defined as $R =$

$\{(a, b) : a < b\}$ is (i) symmetric, (ii) transitive

CBSE Board Paper 2020

Q.No.20: Fill in the blank.

A relation R on a set A is called _____, if $(a_1, a_2) \in R$ and $(a_2, a_3) \in R$ implies that $(a_1, a_3) \in R$, for $a_1, a_2, a_3 \in A$.

CBSE Board Paper 2020

Q.No.21: Let set $X = \{1, 2, 3\}$ and a relation R is defined in X as : $R = \{(1, 3), (2, 2), (3, 2)\}$, then minimum ordered pairs which should be added in relation R to make it reflexive and symmetric are

- (a) $\{(1, 1), (2, 3), (1, 2)\}$
- (b) $\{(3, 3), (3, 1), (1, 2)\}$
- (c) $\{(1, 1), (3, 3), (3, 1), (2, 3)\}$
- (d) $\{(1, 1), (3, 3), (3, 1), (1, 2)\}$

CBSE Board Paper 2021

Q.No.22: If $R = \{(x, y); x, y \in Z, x^2 + y^2 \leq 4\}$ is a relation in set Z, then domain of R is

- (a) $\{0, 1, 2\}$
- (b) $\{-2, -1, 0, 1, 2\}$
- (c) $\{0, -1, -2\}$
- (d) $\{-1, 0, 1\}$

CBSE Board Paper 2021

Q.No.23: Let $X = \{x^2 : x \in \mathbf{N}\}$ and the function $f : \mathbf{N} \rightarrow X$ is defined by $f(x) = x^2, x \in \mathbf{N}$. Then this function is

- (a) injective only
- (b) not bijective
- (c) surjective only
- (d) bijective

CBSE Board Paper 2021

Q.No.24: A function $f: \mathbf{R} \rightarrow \mathbf{R}$ defined by $f(x) = 2 + x^2$ is

- (a) not one-one
- (b) one-one
- (c) not onto
- (d) neither one-one nor onto

CBSE Board Paper 2021

Q.No.25: Let $A = \{3, 5\}$. Then number of reflexive relations on A is

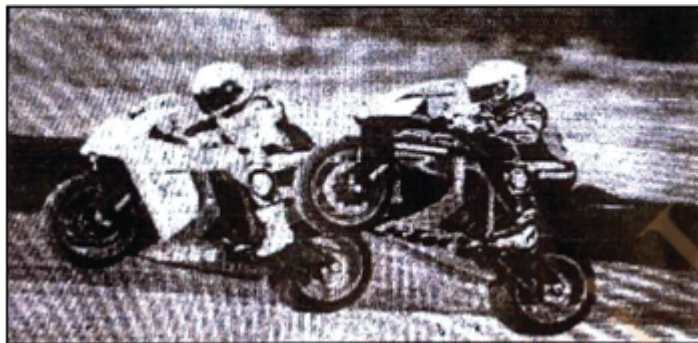
- (a) 2
- (b) 4
- (c) 0
- (d) 8

CBSE Board Paper 2023

Q.No.26: Case Study

An organization conducted bike race under two different categories - Boys and Girls. There were 28 participants in all. 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 $B = \{b_1, b_2, b_3\}$ and $G = \{g_1, g_2\}$, where B represents the set of Boys selected and G the set of Girls selected for the final race.



Based on the above information, answer the following questions

(I) How many relations are possible from B to G ?

(II) Among all the possible relations from B to G, how many functions can be formed from B to G ?

(III) Let $R : B \rightarrow B$ be defined by $R = \{(x, y) : x \text{ and } y \text{ are students of the same sex}\}$. Check if R is an equivalence relation.

OR

(III) A function $f : B \rightarrow G$ be defined by $f = \{(b_1, g_1), (b_2, g_2), (b_3, g_1)\}$. Check if f is bijective. Justify your answer.

CBSE Board Paper 2023

Q.No.27: Let R be a relation in the set N given by $R = \{a, b\} : a = b - 2, b > 6\}$.

Then

- (a) $(8, 7) \in R$
- (b) $(6, 8) \in R$
- (c) $(3, 8) \in R$
- (d) $(2, 4) \in R$

CBSE Board Paper 2023

Q.No.28: If $f(x) = |\cos x|$, then $f\left(\frac{3\pi}{4}\right)$ is

- (a) 1
- (b) -1
- (c) $\frac{-1}{\sqrt{2}}$
- (d) $\frac{1}{\sqrt{2}}$

CBSE Board Paper 2023

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