MATHS

BOOKS - NCERT MATHS (ENGLISH)

RELATIONS AND FUNCTIONS

Short Answer Type Questions

1. Let $A = \{a, b, c)$ and the relation R be defined on A as follows: $R = \{(a, a), (b, c), (a, b)\}$. Then, write minimum number of ordered pairs to be added in R to make it reflexive and transitive.

Watch Video Solution

2. Let D be the domain of the real valued function f defined by $f(x) = \sqrt{25 - x^2}$. Then, write D.

Watch Video Solution

3. If $f, g: R \rightarrow R$ be defined by $f(x) = 2x + 1$ and $g(x) = x^2 - 2, \forall x \in R,$ respectively. Then , find gof .

Watch Video Solution

4. Let $f: R \rightarrow R$ be the function defined by $f(x) = 2x - 3, \forall x \in R.$ Write f^{-1}.

Watch Video Solution

5. Let $A = \{a, b, c, d\} and f : A\overrightarrow{A}$ be given by $f = \{(a, b), (b, d), (c, a), (d, c)\}$, write f^{-1}.

Watch Video Solution

6. If $f : R \rightarrow R$ is defined by $f(x) = x^2 - 3x + 2$, write $f\{f(x)\}$.

Watch Video Solution

7. A={1,2,3,4} and B={1,3,5,7} and g:A->B. Is $g = \{(1, 1), (2, 3), (3, 5,), (4, 7)\}$ a function? If this is described by the formula, $g(x) = \alpha x + \beta$, then what values should be assigned to α and β?

Watch Video Solution

8. Are the following set of ordered pairs functions? If so, examine whether the mapping is injective or surjective:(i) $\{(x, y) : x$ is a person, y is the mother of $x\}$ (ii) $\{(a, b) : a$ is a person, b is an ancestor of $a\}$

Watch Video Solution

9. If the functions f and g are given by $f = \{(1, 2), (3, 5), (4, 1)\}$ and $g = \{(2, 3), (5, 1), (1, 3)\}$, find range of f and g. Also, write down fog and gof as sets of ordered pairs.

Watch Video Solution

10. Let C be the set of complex numbers. Prove that the mapping $F: C \to R$ given by $f(z) = |z|, \forall z \in C,$ is neither one-one nor onto.

Watch Video Solution

11. Let the function $f: R \to R$ be defined by $f(x) = \cos x, \forall x \in R.$ Show that f is neither one-one nor onto.

Watch Video Solution

12. Let X = { 1, 2, 3} and Y= {4, 5}. Find whether the following subsets of $X \times Y$ are functions from X to Y or not.

(i) f = {(1, 4), (1, 5), (2, 4), (3, 5)} (ii) g = {(1, 4), (2, 4), (3, 4)}

(iii) h = {(1, 4), (2, 5), (3, 5) } (iv) k = {(1, 4), (2, 5)}

Watch Video Solution

13. If functions $f: A \to B$ and $g: B \to A$ satisfy $gof = I_A$, then show that f is one-one and g is onto.

Watch Video Solution

14. Let $f: R \to R$ be the function defined by $f(x) = \frac{1}{2 - \cos x}, \forall x \in R$. Then, find the range of f.

Watch Video Solution

15. Let n be a fixed positive integer. Define a relation R on Z as follows:

$(a, b) \in R \Leftrightarrow a - b$ is divisible by n. Show that R is an equivalence relation on Z.

Watch Video Solution

Long Answer Type Questions

1. If A = {1, 2, 3, 4}, define relations on A which have properties of being

(i) reflexive, transitive but not symmetric.

(ii) symmetric but neither reflexive nor transitive.

(iii) reflexive, symmetric and transitive.

Watch Video Solution

2. Let R be a relation defined on the set of natural numbers N as $R = \{(x, y) : x, y \in N, 2x + y = 41\}$ Find the domain and range of R. Also, verify whether R is (i) reflexive, (ii) symmetric (iii) transitive.

Watch Video Solution

3. Given, $A = \{2, 3, 4\}, B = \{2, 5, 6, 7\}$.

Construct an example of each of the following

(i) an injective mapping from A to B.

(ii) a mapping from A to B which is not injective.

(iii) a mapping from B to A.

Watch Video Solution

4. Give an example of a function which is one-one but not onto.

Watch Video Solution

5. Let $A = R - \{2\}$ and $B = R - \{1\}$. If $f: A \to B$ is a mapping defined by $f(x) = \frac{x-1}{x-2}$, show that f is bijective.

Watch Video Solution

6. Let $A = [-1, 1]$. Then, discuss whether the following functions from A to itself are one-

one onto or bijective: $f(x) = \frac{x}{2}$ (ii) $g(x) = |x|$ (iii) $h(x) = x^2$

Watch Video Solution

7. Each of the following defines a relation on N: (i) $x + y = 10, \ x, \ y \in N$ (ii) xy is square of an integer, $x, \ y \in N$ (iii) $x + 4y = 10, \ x, \ y \in N$

Watch Video Solution

8. Let $A = \{1, 2, 3, , 9\}$ and R be the relation on $A \times A$ defined by $(a, b) R (c, d)$ if $a + d = b + c$ for all $(a, b), (c, d) \in A \times A$. Prove that R is an equivalence relation and also obtain the equivalence class [(2, 5)].

Watch Video Solution

9. Using the definition, Prove that the function $f: A \to B$ is invertible if and only if f is both one-one and onto.

Watch Video Solution

10. If $f, g : \overrightarrow{RR}$ are defined respectively by $f(x) = x^2 + 3x + 1, g(x) = 2x - 3,$ find fog (ii) gof (iii) fof (iv) gog.

Watch Video Solution

11. Let $*$ be the binary operation defined on Q. Find which of the following binary operations are commutative

(i) $a * b = a - b, \forall a, b \in Q$ (ii) $a * b = a^2 + b^2, \forall a, b \in Q$

(iii) $a * b = a + ab, \forall a, b \in Q$ (iv) $a * b = (a - b)^2, \forall a, b \in Q$

Watch Video Solution

12. Let * be a binary operation on R defined by $a \cdot b = ab + 1$. Then, * is commutative but not associative associative but not commutative neither commutative nor associative (d) both commutative and associative

Watch Video Solution

Objective Type Questions

1. Let T be the set of all triangles in a plane with R a relation in T given by $R = \{(T_1, T_2) : T_1 \cong T_2\}$. Show that R is an equivalence relation.

A. reflexive but not transitive

B. transitive but not symmetric

C. equivalence

D. None of these

Answer: C

Watch Video Solution

2. Consider the non-empty set consisting of children in a family and a relation R defined as aRb, if a is brother of b. Then, R is

A. symmetric but not transitive

B. transitive but not symmetric

C. neither symmetric nor transitive

D. both symmetric and transitive

Answer: B

Watch Video Solution

3. The maximum number of equivalence relations on the set A = {1, 2, 3} are

A. 1

B. 2

C. 3

D. 5

Answer: D

Watch Video Solution

4. If a relation R on the set $\{1, 2, 3\}$ be defined by $R = \{(1, 2)\}$, then R is:

A. reflexive

B. transitive

C. symmetric

D. None of these

Answer: B

Watch Video Solution

5. Let us define a relation R in R as aRb if $a \geq b$

. Then, R is

A. an equivalence relation

B. reflexive, transitive but not symmetric

C. symmetric, transitive but not reflexive

D. neither transitive nor reflexive but symmetric

Answer: B

Watch Video Solution

6. If $A = \{1, 2, 3\}$ and consider the relation

$R = \{(1, 1), (2, 2), (3, 3), (1, 2), (2, 3), (1, 3)\}$

Then, R is

A. reflexive but not symmetric

B. reflexive but not transitive

C. symmetric and transitive

D. neither symmetric nor transitive

Answer: A

Watch Video Solution

7. The identity element for the binary operation $*$ defined on Q - {0} as $a * b = \frac{ab}{2}, \forall a, b \in Q - \{0\}$ is

A. 1

B. 0

C. 2

D. None of these

Answer: C

Watch Video Solution

8. If the set A contains 5 elements and the set B contains 6 elements, then the number of one-one and onto mappings from A to B is 720 (b) 120 (c) 0 (d) none of these

A. 720

B. 120

C. 0

D. None of these

Answer: C

Watch Video Solution

9. Let $A = \{1, 2, , n\}$ and $B = \{a, b\}$. Then the number of subjections from A into B is

${}^nP_2$ (b) $2^n - 2$ (c) $2^n - 1$ (d) ${}^nC_2$

A. ${}^nP_2$

B. $2^n - 2$

C. $2^n - 1$

D. None of these

Answer: D

Watch Video Solution

10. If $f: R \rightarrow R$ be defined by $f(x) = \frac{1}{x}, \forall x \in R$. Then , f is

A. one-one

B. onto

C. bijective

D. f is not defined

Answer: D

Watch Video Solution

11. If $f: R \to R$ be defined by $f(x) = 3x^2 - 5$ and $g: R \to R$ by $g(x) = \dfrac{x}{x^2+1}$. Then, gof is

A. $\dfrac{3x^2-5}{9x^4-30x^2+26}$

B. $\dfrac{3x^2-5}{9x^4-6x^2+26}$

C. $\dfrac{3x^2}{x^4+2x^2-4}$

D. $\dfrac{3x^2}{9x^4+30x^2-2}$

Answer: A

Watch Video Solution

12. Which of the following function from Z to itself are bijections? $f(x) = x^3$ (b) $f(x) = x + 2$ $f(x) = 2x + 1$ (d) $f(x) = x^2 + x$

A. $f(x) = x^3$

B. $f(x) = x + 2$

C. $f(x) = 2x + 1$

D. $f(x) = x^2 + 1$

Answer: B

Watch Video Solution

13. $f: R \to R$ defined by $f(x) = x^2 + 5$

A. $(x+5)^{\frac{1}{3}}$

B. $(x-5)^{\frac{1}{3}}$

C. $(5-x)^{\frac{1}{3}}$

D. $5-x$

Answer: B

Watch Video Solution

14. If $f: A \rightarrow B, g: B \rightarrow C$ are bijective functions show that $gof: A \rightarrow C$ is also a bijective function.

A. $f^{-1} o g^{-1}$

B. fog

C. $g^{-1} o f^{-1}$

D. gof

Answer: A

View Text Solution

15. Let $f: R - \left\{\frac{3}{5}\right\} \to R$ be defined by $f(x) = \frac{3x+2}{5x-3}$. Then

A. $f^{-1}(x) = f(x)$

B. $f^{-1}(x) = -f(x)$

C. $(fof)x = -x$

D. $f^{-1}(x) = \frac{1}{9}f(x)$

Answer: A

Watch Video Solution

16. If $f(x)$ is defined on $[0, 1]$ by the rule $f(x) = \{x,$ if x is rational ,$1 - x,$ if x is rational ' then for all $x \in [0, 1]$,$f(f(x))$ is

A. constant

B. 1+x

C. x

D. None of these

Answer: C

Watch Video Solution

17. If $f:[2,\infty)\to R$ be the function defined by $f(x)=x^2-4x+5,$ then the range of f is

A. R

B. $[1,\infty)$

C. $[4,\infty)$

D. $[5,\infty)$

Answer: B

Watch Video Solution

18. Let $f: N \to R$ be the function defined by $f(x) = \frac{2x-1}{2}$ and $g: Q \to Q$ be another function defined by $g(x) = x + 2$ then $(gof)\left(\frac{3}{2}\right)$ is

A. 1

B. 1

C. $\frac{7}{2}$

D. None of these

Answer: D

Watch Video Solution

19. If $f : R \rightarrow R$ be defined by

$$f(x) = \begin{cases} 2x : x > 3 \\ x^2 : 1 < x \leq 3 \\ 3x : x \leq 1 \end{cases}$$

Then, $f(-1) + f(2) + f(4)$ is

A. 9

B. 14

C. 5

D. None of these

Answer: A

Watch Video Solution

20. If $f: R \rightarrow R$ be given by $f(x) = \tan x$, then $f^{-1}(1)$ is

A. $\frac{\pi}{4}$

B. $\left\{n\pi + \frac{\pi}{4} : n \in Z\right\}$

C. Does not exist

D. None of these

Answer: A

Watch Video Solution

Fillers

1. Let the relation R be defined in N by aRb, if $2a + 3b = 30$. Then R = ...

Watch Video Solution

2. If the relation R be defined on the set $A = \{1, 2, 3, 4, 5\}$ by $R = \{(a, b) : |a^2 - b^2| < 8\}$. Then, R is given by ....

Watch Video Solution

3. If the functions f and g are given by $f = \{(1, 2), (3, 5), (4, 1)\}$ and $g = \{(2, 3), (5, 1), (1, 3)\}$, find range of f and g. Also, write down fog and gof as sets of ordered pairs.

Watch Video Solution

4. If $f: R \to R$ be defined by $f(x) = \frac{x}{\sqrt{1+x^2}}$, then $(fofof)(x) = \ldots\ldots\ldots\ldots\ldots$

Watch Video Solution

5. If $f(x) = \left[4 - (x-7)^3\right]$, then $f^{-1}(x) = \ldots\ldots\ldots\ldots\ldots$

Watch Video Solution

6. State true or false for the given statement :

Let R = { (3, 1), (1, 3), (3, 3)} be a relation defined on the set A = {1, 2, 3}. Then, R is symmetric, transitive but not reflexive.

Watch Video Solution

7. If $f: R \to R$ be the function defined by $f(x) = \sin(3x + 2) \forall x \in R.$ Then, f is invertible.

Watch Video Solution

8. Every relation which is symmetric and transitive is also reflexive.

Watch Video Solution

9. An integer m is said to be related to another integer n if m is a multiple of n. Check if the relation is symmetric, reflexive and transitive.

Watch Video Solution

10. Let $A = \{0, 1\}$ and the set of all natural numbers.Then the mapping $f: N \rightarrow A$ defined by $f(2n-1) = 0, f(2n) = 1, \forall n \in N,$ is

Watch Video Solution

11. The relation R on the set A = {1, 2, 3} defined as R ={(1, 1), (1, 2), (2, 1), (3, 3)} is reflexive, symmetric and transitive.

Watch Video Solution

12. The composition of function is commutative.

Watch Video Solution

13. The composition of functtions is associative

Watch Video Solution

14. Every function is invertible.

Watch Video Solution

15. A binary operation on a set has always the identity element.

Watch Video Solution