



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.



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

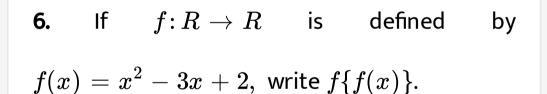


4. Let $f\!:\!R o R$ be the function defined by $f(x)=2x-3,\,orall x\in R.$ Write $f^{-1}.$

5. Let $A = \{a, b, c, d\} and f \colon \stackrel{
ightarrow}{A^{
ightarrow}}$ be given by

 $f = \{(a, b), (b, d), (c, a), (d, c)\}, ext{ write } f^{-1} \cdot$

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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 ?

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

person, y is the mother of x $\{(a, b): a \}$ (ii)

a person, b is an ancestor of a}



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.



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

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11. Let the function $f\!:\!R o R$ be defined by

 $f(x)=\cos x,\,orall x\in R.$ Show that f is

neither one-one nor onto.

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)}

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

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14. Let $f\colon R o R$ be the function defined by $f(x)=rac{1}{2-\cos x},\ orall x\in R.$ Then, find the range of f.

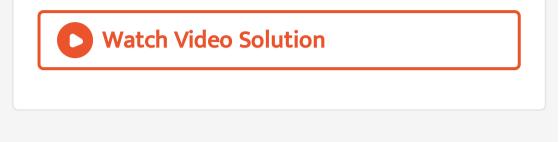
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15. Let n be a fixed positive integer. Define a

relation R on Z as follows:

 $(a,\ b)\in R\Leftrightarrow a-b$ is divisible by n_{\cdot} Show

that R is an equivalence relation on Z_{\cdot}



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.



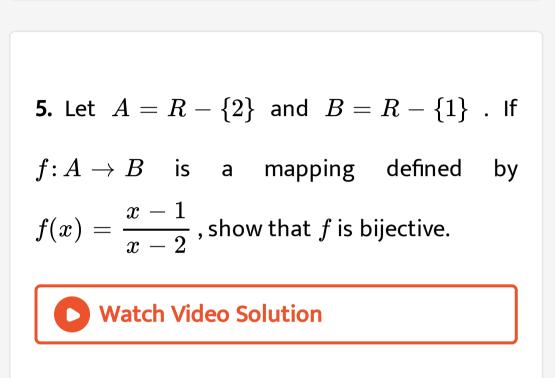
2. Let R be a relation defined on the set of natural numbers N as $R = \{(x, y) : x, y \in N, 2x + y = 41\}$ Find the domain and range of R. Also, verify whether R is (i) reflexive, (ii) symmetric (iii) transitive. Given, A = {2, 3, 4}, B = {2, 5, 6, 7}.
Construct an example of each of the following
(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.

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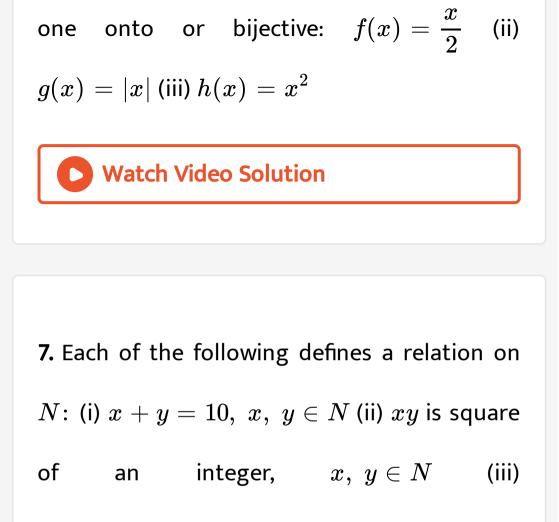
4. Give an example of a function which is one-

one but not onto.



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



 $x+4y=10,\ x,\ y\in N$

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)].

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

one-one and onto.



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

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11. Let * be the binary operation defined on Q

. Find which of the following binary operations

are commutative

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

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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



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



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

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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

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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

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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

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

7. The identity element for the binary operation * defined on Q - {0} as $a*b=rac{ab}{2}, \ orall a, b\in Q-\{0\}$ is A.1

B. 0

C. 2

D. None of these

Answer: C



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

9. Let $A = \{1, 2, , n\}$ and $B = \{a, b\}$. Then the number of subjections from A into B is ${}^{n}P_{2}$ (b) $2^{n} - 2$ (c) $2^{n} - 1$ (d) ${}^{n}C_{2}$

A. $^{n}P_{2}$

B. $2^{n} - 2$

 $C. 2^n - 1$

D. None of these

Answer: D



10. If
$$f\!:\!R o R$$
 be defined by $f(x)=rac{1}{x},\,orall x\in R.$ Then , f is

- A. one-one
- B. onto
- C. bijective
- D. f is not defined

Answer: D



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

A.
$$rac{3x^2-5}{9x^4-30x^2+26}$$
B. $rac{3x^2-5}{9x^4-6x^2+26}$
C. $rac{3x^2}{x^4+2x^2-4}$
D. $rac{3x^2}{9x^4+30x^2-2}$

Answer: A

12. Which of the following function from Z to itself are bijections? $f(x) = x^3$ (b) $f(x) = x+2 \qquad \quad f(x) = 2x+1$ (d) $f(x) = x^2 + x$ A. $f(x) = x^3$ B. f(x) = x + 2C. f(x) = 2x + 1D. $f(x) = x^2 + 1$

Answer: B



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

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

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

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

D.
$$5-x$$

Answer: B



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

A.
$$f^{-1} og^{-1}$$

 $\mathsf{B.} fog$

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

 $\mathsf{D}.\,gof$

Answer: A

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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



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

A. constant

B. 1+x

C. x

D. None of these

Answer: C



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

A. R

- $\mathsf{B}.\left[1,\infty\right)$
- $\mathsf{C}.\left[4,\infty
 ight)$

D. $[5,\infty)$

Answer: B



18. Let $f\colon N o R$ be the function defined by $f(x)=rac{2x-1}{2}$ and $g\colon Q o Q$ be another function defined by g(x)=x+2 then $(gof)igg(rac{3}{2}igg)$ is

A. 1

B. 1

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

D. None of these

Answer: D

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19. If
$$f:R o R$$
 be defined by $f(x)=egin{cases} 2x\colon x>3\ x^2\colon 1< x\leq 3\ 3x\colon x\leq 1 \end{cases}$ Then, $f(-1)+f(2)+f(4)$ is

A. 9

B. 14

D. None of these

Answer: A

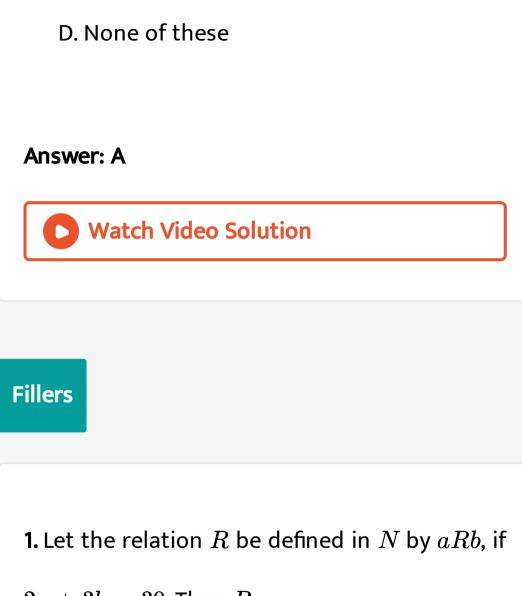
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20. If $f\!:\!R o R$ be given by f(x)= an x, then $f^{-1}(1)$ is

A.
$$\displaystyle rac{\pi}{4}$$

B. $\displaystyle \left\{ n\pi + \displaystyle rac{\pi}{4} \! : \! n \in Z
ight\}$

C. Does not exist

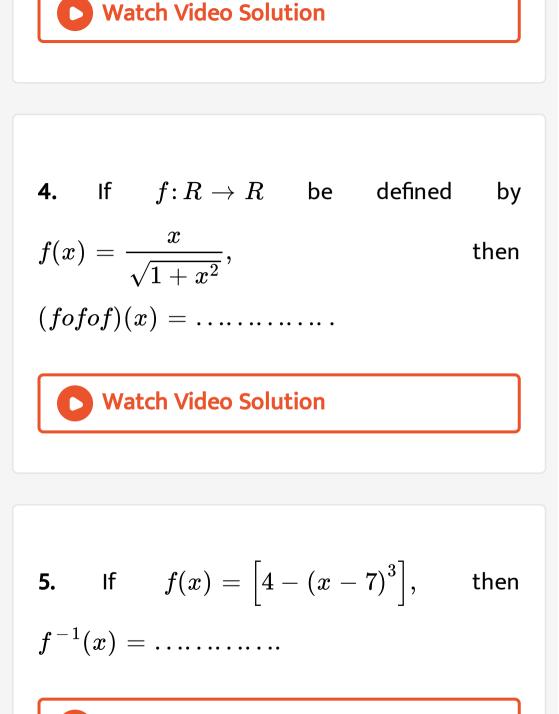


2a+3b=30. Then R =

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

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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.



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.

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

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

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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.



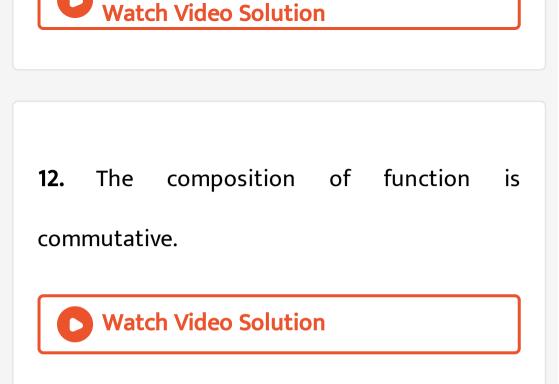
10. Let $A=\{0,1\}$ and the set of all natural numbers.Then the mapping $f\colon N o A$ defined by

f(2n-1)=0, f(2n)=1, $orall n\in N,$ is

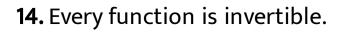
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11. The relation R on the set A = {1, 2, 3} defined as R ={(1, 1), (1, 2), (2, 1), (3, 3)} is reflexive, symmetric and transitive.





13. The composition of functtions is associative





15. A binary operation on a set has always the

identity element.