



MATHS

BOOKS - NCERT MATHS (HINGLISH)

RELATIONS AND FUNCTIONS

Relations And Functions

on

1. Let $A = \{a, b, c\}$ and the relation R be defined as follows:

Α

 $R = \{(a, a), (b, c), (a, b)\}$. 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 .

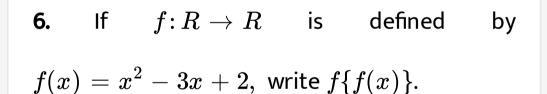


4. Let $f\!:\!R o R$ be the function defined by $f(x)=2x-3,\,orall x\in R.$ Write $f^{-1}.$

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. 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 ?

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



16. 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.



17. 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.

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18. 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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19. Give an example of a function which is one-

one but not onto. which is not one-one but

onto. (iii) which is neither one-one nor onto.

20. 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.
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21. 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) $h(x) = x^2$

22. Each of the following defines a relation on

N:

(i) $x>y,\;x,\;y\in N$

(ii) $x+y=10,\;x,\;y\in N$

(iii) xy is square of an integer, $x, \; y \in N$

(iv) $x+4y=10,\;x,\;y\in N$

Determine which of the above relations are

reflexive, symmetric and transitive.



23. 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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24. Using the definition, Prove that the function $f\colon A o B$ is invertible if and only if f

is both one-one and onto.



25. 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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26. 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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27. 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

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28. Let T be the set of all triangles in a plane with R a relation in T given by $R = \{(T_1, T_2): T_1(iscongruenttoT)_2\}$. 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



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

B. 2

C. 3

D. 5

Answer: D

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31. 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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32. 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

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33. 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

34. 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

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35. 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

36. Let $A = \{1, 2, ..., n\}$ and $B = \{a, b\}$. Then number of subjections from A into B is nP2 (b) $2^n - 2$ (c) $2^n - 1$ (d) nC2

- A. $^{n}P_{2}$
- B. $2^{n} 2$
- $C. 2^n 1$
- D. None of these

Answer: D



37. 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

38. 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



39. Which of the following functions from Z to

itself are bijections? a

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

$$\mathsf{B.}\,f(x)=x+2$$

 $\mathsf{C}.\,f(x)=2x+1$

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

Answer: B

40. $f{:}R o R$ defined by $f(x) = x^2 + 5$

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

B. $(x-5)^{rac{1}{3}}$
C. $(5-x)^{rac{1}{3}}$

$$\mathsf{D}.\,5-x$$

Answer: B

41. If $f: A \to B$ and $g: B \to C$ be the bijective functions, then $(gof)^{-1}$ is

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

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

D.
$$gof$$

Answer: A

42. Let
$$f:R-\left\{\frac{3}{5}\right\}
ightarrow R$$
 be defined by
 $f(x)=rac{3x+2}{5x-3}$. Then
A. $f^{-1}(x)=f(x)$
B. $f^{-1}(x)=-f(x)$
C. $(fof)x=-x$
D. $f^{-1}(x)=rac{1}{9}f(x)$

Answer: A

43. 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

44. 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

- B. $[1,\infty)$
- $\mathsf{C}.\left[4,\infty
 ight)$
- D. $[5,\infty)$

Answer: B

45. 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

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

D. None of these

Answer: D



46. 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

- C. 5
- D. None of these

Answer: A



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

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

B. $\left\{ n\pi + rac{\pi}{4} \colon n \in Z
ight\}$

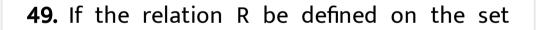
- C. Does not exist
- D. None of these

Answer: A

48. Let the relation R be defined in N by $a \ R \ b$

, if 2a+3b=30. Then R =

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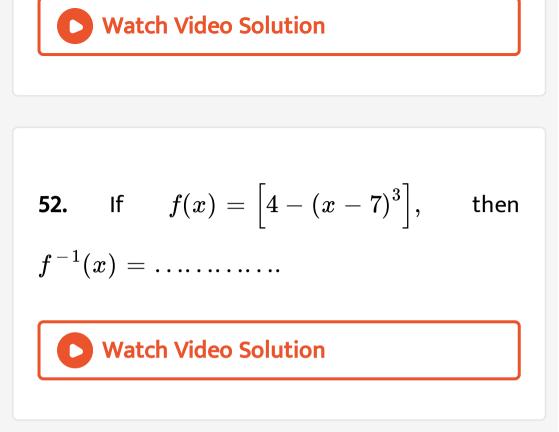
 $A = \{1, 2, 3, 4, 5\}$ by

 $R=ig\{(a,b)\!:\!ig|a^2-b^2ig|<8ig\}.$ Then, R is given

by

50. 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.

51. If
$$f\!:\!R o R$$
 be defined by $f(x)=rac{x}{\sqrt{1+x^2}},$ then $(fofof)(x)=\ldots\ldots$



53. 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.





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

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

56. 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.



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

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

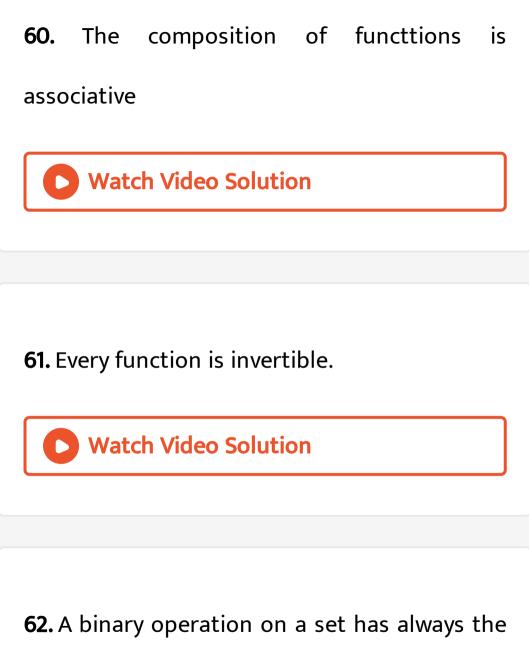


58. The relation R on the set A = {1, 2, 3} defined as R ={(1, 1), (1, 2), (2, 1), (3, 3)} is reflexive, symmetric and transitive.

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59. The composition of function is

commutative.



identity element.

