MATHS

BOOKS - ML KHANNA

CONCEPTS OF SET THEORY

Example

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

$f_1 = \{(1, 4), (1, 5), (2, 4), (3, 5)\}$,

View Text Solution

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

$f_2 = \{(1, 4), (2, 4), (3, 4)\}$,

View Text Solution

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

View Text Solution

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

$f_4 = \{(1, 4), (2, 5)\}$

View Text Solution

5. Let R be the set of all real numbers and let $A = \{0, 1\}$. Let

$f: R \to A$ defined by

$f(x) = \begin{cases} 0 & \text{when x is rational} \\ 1 & \text{when x is irrational} \end{cases}$

then find its period

A. 1

B. 2

C. Non periodic

D. Periodic but having no period

Answer:

Watch Video Solution

6. Let $f: R \to R$ be defined by

$f(x) = x^2 \, \forall x \in R.$

A. f is one-one onto

B. f is many-one onto

C. f is one-one but not onto

D. f is neither one-one nor onto

Answer:

Watch Video Solution

7. Draw the graph of the function: $f: R \to R$ defined by $f(x) = x^3, x \in R$

Watch Video Solution

Problem Set 1

1. Let A and B be two disjoint subsets of a universal set U. Then $(A \cup B) \cap B' =$

A. A

B. B

C. ϕ

D. None of these

Answer: A

Watch Video Solution

2. Let $A = \{x : x \in R, x \geq 2\}$ and $B = \{x : x \in R, x < 4\}$ Then $A \cap B =$

A. $\{x : x \in R, 2 < x < 4\}$

B. $\{x : x \in R, 2 \leq x < 4\}$

C. B

D. None of these

Answer: B

Watch Video Solution

3. Let $A = \{(x : x \in R, |x| < 1\}$,

$B = \{x : x \in R, |x - 1| \geq 1\}$

and $A \cup B = R - D$, then set D is

A. $\{x : 1 < x \leq 2\}$

B. $\{x : 1 \leq x < 2\}$

C. $\{x : 1 \leq x \leq 2\}$

D. None of these

Answer: B

Watch Video Solution

4. If X and Y are two sets, then $X \cap (X \cup Y)$ equals

A. X

B. Y

C. ϕ

D. None of these

Answer: A

Watch Video Solution

5. If $A = \{\phi, \{\phi\}\}$, then the power set P (A) of A is

A. A

B. $\{\phi, \{\phi\}, A\}$

C. $\{\phi, \{\phi\}, \{\{\phi\}\}, A\}$

D. None of these

Answer: C

Watch Video Solution

6. A set contains n elements. The power set contains

A. n elemets

B. 2^n elements

C. n^2 elemets

D. none of these

Answer: B

Watch Video Solution

7. $A - (A - B)' =$

Watch Video Solution

8. $(A \cup B) - C = (A - C) \cup \ldots.$

Watch Video Solution

9. $A-(B\cup C\cup D)=(A-B)\cap\ldots\cap\ldots$

Watch Video Solution

10. Set $A=\left\{x:x\in I,x^4-x^3-2x^2+2x=0\right\}$

$B=\left\{x:x\in N,2x^2-1<7\right\}$

Are A and B comparable ?

Watch Video Solution

11. Let $A=\left\{(x,y):x,y\in R,x^2+y^2=1\right\}$

and $B=\{(x,0):x\in R,\ -1\leq x\leq 1\}$. Then $A\cap B=\ldots$

View Text Solution

12. $(A-B)\cup(B-A)=(A\cup B)\cap(A'\cup B')$

View Text Solution

13. (i) $A - (B - C) = (A - B) \cup (A \cap C)$

(ii) $A - B = (A \cup B) - B = A - (A \cap B)$

Verify these equalities if

$A = \{1, 2, 3, 4, 5, 6, 7\}, B = \{3, 5, 6, 7, 9, 11\}$ and $C = (2, 5, 6, 9, 20\}$

View Text Solution

14. Let U be the set of all people and M = {Males},

S = {College students},

T = {Teenagers}, W = {People having height more than five feet}.

Express each of the following in the notation of set theory.

(i) College student having heights more than five feet

(ii) People who are not teenagers and have their height less five feet

(iii) All people who are neither males nor teenagers nor college students.

Watch Video Solution

15. Let U be the set of all people and M = {Males},

S = {College students},

T = {Teenagers}, W = {People having height more than five feet}.

Express each of the following in the notation of set theory.

(i) College student having heights more than five feet

(ii) People who are not teenagers and have their height less five feet

(iii) All people who are neither males nor teenagers nor college students.

Watch Video Solution

16. Let U be the set of all people and M = {Males},

S = {College students},

T = {Teenagers}, W = {People having height more than five feet}.

Express each of the following in the notation of set theory.

(i) College student having heights more than five feet

(ii) People who are not teenagers and have their height less five feet

(iii) All people who are neither males nor teenagers nor college students.

Watch Video Solution

17. Find the smallest set A such that $A \cup \{1, 2\} = \{1, 2, 3, 5, 9\}$.

Watch Video Solution

18. Let $A = \{1, 2, 3\}, B = \{2, 4, 6, 8\}, C = \{2, 3, 5, 6\}$. Then $A \cap (B \cup C), \ldots .$

View Text Solution

19. Let $A = (x : x \in R, \ -1 \leq x \leq 1\}$ and

$B = \{x : x \in R, |x| \leq 1\}$

Are the sets A and B equal ?

View Text Solution

20. If

$A = (2, 3, 4, 8, 10\}, B = (3, 4, 5, 10, 12\}$ and $C = (4, 5, 6, 12, 14)$,

find $(A \cup B) \cap (A \cup C)$ and $(A \cap B) \cup (A \cap C)$.

Watch Video Solution

21. Given the sets $A = \{1, 2, 3\}$, $B = \{3, 4\}$, $C = \{4, 5, 6\}$, then find $A \cup (B \cap C)$.

A. $\{3\}$

B. $\{1, 2, 3, 4\}$

C. $\{1, 2, 5, 6\}$

D. $\{1, 2, 3, 4, 5, 6\}$

Answer: B

Watch Video Solution

22. If $aN = \{ax : x \in N\}$, then the set $3N \cap 7N$ is

Watch Video Solution

23. if a N=$\{ax : xi \in N\}$ and $bN \cap cN$, where b,c in N`are relatively prime , then

A. $d = bc$

B. $c = bd$

C. $b - cd$

D. none of these

Answer: A

Watch Video Solution

24. Set A = {x : x is a digit in the number 3591}

$B = \{x : x \in N, x < 10\}$. Find $A \cup B$, $A \cap B$, $A - B$ and $B - A$.

View Text Solution

25. Set $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$,

$A = \{x : x \in N, 30 \leq x^2 \leq 70\}$

$B = \{x : x$ is a prime number $< 10\}$.

Find A', B', $(A \cup B)'$, $A' \cap B'$, $(A - B)'$

View Text Solution

26. Comment on the following statements

$A - B = A \cap B' = B' - A'$

View Text Solution

27. Comment on the following statements

$A \cap (B - C) = (A \cap B) - (A \cap C)$

View Text Solution

28. Comment on the following statements

$A\Delta B = (A \cup B) - (A \cap B)$

View Text Solution

29. For two sets A and B, $A \cap (A \cup B) =$

A. A

B. B

C. ϕ

D. None of these

Answer: B

View Text Solution

30. Which of the following is the empty set ?

A. $\{x : x \text{ is a real number and } x^2 - 1 = 0\}$

B. $\{x : x \text{ is a real number and } x^2 + 1 = 0\}$

C. $\{x : x \text{ is a real number and } x^2 - 9 = 0\}$

D. $\{x : x \text{ is a real number and } x^2 = x + 2\}$

Answer: B

Watch Video Solution

31. The number of bijective functions from set A to itself when A contains 106 elements is

A. 106

B. $(106)^2$

C. (106)!

D. 2^{106}

Answer: C

Watch Video Solution

32. If X and Y are two sets, then $X \cap (Y \cup X)'$ equals

A. X

B. Y

C. ϕ

D. None of these

Answer: C

Watch Video Solution

33. if set A and B are defined as $A = \{(x, y) : y = e^x, x \in R\}$

$B = \{(x, y) : y = x, x \in R\}$. then

A. $B \subset A$

B. $A \subset B$

C. $A \cap B = \phi$

D. $A \cup B = A$

Answer: C

Watch Video Solution

34. Let $A = \{(x, y) : y = e^x, x \in R\} B = \{(x, y), Y = e^{-x}, x \in R\}$ then

A. $A \cap B = \phi$

B. $A \cap B \neq \phi$

C. $A \cup B = R^2$

D. none of these

Answer: B

Watch Video Solution

35. Given $A = \{1, 2, 3\}, B = \{3, 4\}, C = \{4, 5, 6\}$, the $AU(BUC)$=

View Text Solution

36. If

$A = \{2, 3\},\ B = \{4, 5\},\ C = \{5, 6\},\ \ f \in d\ A \times (B \cup C),\ A \times (B \cap C),$

Watch Video Solution

37. If

$A = \{2, 3\},\ B = \{4, 5\},\ C = \{5, 6\},\ \ f \in d\ A \times (B \cup C),\ A \times (B \cap C),$

Watch Video Solution

38. If $A = \{2, 3, 5\}, B = \{2, 5, 6\},$ then $(A - B) \times (A \cap B)$ is

A. $\{(3, 2), (3, 3), (3, 5)\}$

B. $\{(3, 2), (3, 5), (3, 6)\}$

C. $\{(3, 2), (3, 5)\}$

D. none of these

Answer: C

Watch Video Solution

39. If A $\{1, 2\}, B = \{1, 3\}, \quad \text{then} \quad (A \times B) \cup (B \times A)$ is equal to

Watch Video Solution

40. If $A = \{2, 4\}$ and $B = \{3, 4, 5\}$, then $(A \cap B) \times (A \cup B)$ is

A. $\{(2, 2), (3, 4), (4, 2), (5, 4)\}$

B. $\{(2, 3), (4, 3), (4, 5)\}$

C. $\{(2, 3), (3, 4), (4, 4), (4, 5)\}$

D. $\{(4, 2), (4, 3), (4, 4), (4, 5)\}$

Answer: D

View Text Solution

41. If $A = \{1, 2, 3\}$ and $B = \{3, 8\}$, then $(A \cup B) \times (A \cap B)$ is

A. $\{(3, 1), (3, 2), (3, 3), (3, 8)\}$

B. $\{(1, 3), (2, 3), (3, 3), (8, 3)\}$

C. $\{(1, 2), (2, 2), (3, 3), (8, 8)\}$

D. $\{(8, 3), (8, 2), (8, 1), (8, 8)\}$

Answer: B

View Text Solution

42. If $A = \{1, 2, 3, 4, 5\}$ and $B = \{2, 3, 6, 7\}$, then the number of elements in the set $(A \times B) \cap (B \times A)$ is

A. 18

B. 8

C. 4

D. 0

Answer: C

Watch Video Solution

43. If $A = \{a, b, c\}, B = \{c, d, e\}, C = \{a, d, f\}$, then $A \times (B \cup C)$ is

A. $\{(a, d), (a, e), (a, c)\}$

B. $\{(a, d), (b, d), (c, d)\}$

C. $\{(d, a), (d, b), (d, c)\}$

D. none of these

Answer: D

View Text Solution

44. A and B are teo sets having 3 and 5 elements respectively and having 2 elements in common. Then the number of elements in $A \times B$ is

A. 6

B. 36

C. 15

D. None of these

Answer: C

Watch Video Solution

45. Sets A and B have 3 and 6 elaments respectively. What can be theminimum number of elements in $A \cup B$

A. 3

B. 6

C. 9

D. 18

Answer: B

Watch Video Solution

46. Suppose $A_1, A_2 \ldots . A_{30}$ are thirty sets each having 5 elements and $B_1 B_2 \ldots . B_n$ are n sets each having 3 elements ,Let $\bigcup_{i=1}^{30} A_1 = \bigcup_{j=1}^{n} B_j = s$ and each element of S belongs to exactly 10 of the A_1 and exactly 9 of the value of n.

A. 15

B. 3

C. 45

D. None of these

Answer: C

Watch Video Solution

47. Consider the set A of all determinants of order 3 with entries 0 or 1 only. Let B be the subset of A consisting of all determinants with value 1. Let C be the subset of the set of all determinants with value -1. Then

A. C is empty

B. B has as amny elements as C

C. $A = B \cup C$

D. B has twice as many elements as C

Answer: B

Watch Video Solution

48. Two finite sets have m and n elements. The total number of subsets of the first set is 56 more than the total number of subsets of the second set. The value of m and n is

A. 7, 6

B. 6, 3

C. 5, 1

D. 8, 7

Answer: B

Watch Video Solution

49. Let $A = \{\theta : 2\cos^2\theta + \sin\theta \leq 2\}$ and $B = \{\theta : \pi/2 \leq \theta \leq 3\pi/2\}$. Then find the value of $A \cap B$

Watch Video Solution

50. If $X = \{4^n - 3n - 1 n \in N\}$ and $Y = \{9(n-1) : n \in N\}$, then $X \cup Y$ is equal to

A. X

B. Y

C. N

D. none of these

Answer: A

Watch Video Solution

51. The sets S and E are defined as given below:

$S = \{(x, y) : |x - 3| < 1 \text{ and } |y - 3| < 1\}$ and

$E = \{(x, y) : 4x^2 + 9y^2 - 32x - 54y + 109 \leq 0\}.$

Show that $S \subset E$.

Watch Video Solution

52. If A, B are two sets, prove that $A \cup B = (A - B) \cup (B - A) \cup (A \cap B)$.

Hence or otherwise prove that

$n(A \cup B) = n(A) + n(B) - n(A \cap B)$

where, n(A) denotes the number of elements in A.

Watch Video Solution

53. Let $n(U) = 700, n(A) = 200, n(B) = 300$ and $n(A \cap B) = 100$, then find $n(A' \cap B')$

A. 400

B. 600

C. 300

D. None

Answer: C

Watch Video Solution

54. In a group of 1000 people, there are 750 who can speak Hindi and 400 who can speak Bengali. How many can speak Hindi only? How many can speak Bengali only? How many can speak both Hindi and Bengali?

Watch Video Solution

55. Of the members of three athletic teams in a certain school, 21 are in the basketball team, 26 in hockey team and 29 in the football team. 14 play hockey and basket ball, 15 play hockey and football, 12 play football and basketball and 8 play all the three games bow many members are there in all?

Watch Video Solution

56. An investigator interviewed 100 students to determine their preferences for the three drinks, milk (M), coffee (C) and tea (T). He reported the following: 10 students has all three drinks M, C, T, 20 had M

and C, 30 had C and T, 25 had M and T, 12 had M only, 5 had C only and 8 had T only. Using a Venn diagram, find how many did not take any of the three drinks?

Watch Video Solution

57. In a survey of 200 students of a school, it was found that 120 study Mathematics, 90 study Physics and 70 study Chemistry , 40 study Mathematics and Physics, 30 study Physics and Chemistry, 50 study Chemistry and Mathematics and 20 none of these subjects. Find the number of students who study all the three subjects.

Watch Video Solution

58. A survey shows that 63% of the Indians like cheese, whereas 76% like apples. If x % of the Indians like both cheese and apples, then x can be

A. $x = 39$

B. $x = 63$

C. $36 \leq x \leq 63$

D. none of these

Answer: C

Watch Video Solution

59. In a pollution study of 1500 Indian rivers the following data were reported. 520 were pulleted by sulphur compounds, 335 were polluted by phosphates, 425 were polluted by crude oil, 100 were polluted by both crude oil and sulphur compounds, 180 were polluted by both sulphur compounds and phosphates, 150 were polluted by both phosphates and crude oil and 28 were polluted by sulphur compounds, phosphates and crude oil. How many of the rivers were polluted by atleast one of the three impurities?

How many of the rivers were polluted by exactly one of the three impurities?

Watch Video Solution

60. A group of 123 workers went to a canteen for cold drinks, ice-cream and tea, 42 workers took ice-cream, 36 tea and 30 cold drinks. 15 workers purchased ice-cream and tea, 10 ice-cream and cold drinks, and 4 cold drinks and tea but not ice-cream, 11 took ice-cream and tea but not cold drinks. Determine how many workers did not purchase anything?

Watch Video Solution

61. A survey of 500 television watchers produced the following information, 285 watch foot-ball, 195 watch hockey, 115 watch basketball, 45 watch football and basketball, 70 watch football and hockey, 50 watch hockey and basketball, 50 do not watch any of the three games. How many watch all the three games ? How many watch exactly one of the three games ?

Watch Video Solution

62. In a town of 10,000 families it was found that 40% families buy newspaper A, 20% families buy newspaper B and 10% families buy newspaper C. 5% families buy A and B, 3% buy B and C and 4% buy A and C. If 2% families buy all the three mewspapers, find the number of families which buy (i) A only

Watch Video Solution

63. In a town of 10,000 families it was found that 40% families buy newspaper A, 20% families buy newspaper B and 10% families buy newspaper C. 5% families buy A and B, 3% buy B and C and 4% buy A and C. If 2% families buy all the three mewspapers, find the number of families which buy (ii) B only

Watch Video Solution

64. In a town of 10,000 families it was found that 40% families buy newspaper A, 20% families buy newspaper B and 10% families buy news-

paper C. 5% families buy A and B, 3% buy B and C and 4% buy A and C. If 2% families buy all the three mewspapers, find the number of families which buy (iii) none of A, B and C

Watch Video Solution

65. The report of one survey of 100 students stated that the numbers studying the various languages were : Sanskrit, Hindi and Tamil, 5, Hindi and Sanskrit, 10, Tamil and Sanskrit, 8, Hindi and Tamil, 20, Sanskrit 30, Hindi 23, Tamil 50. The surveyor who prepared the report was fired. Why ?

Watch Video Solution

66. A survey conducted on 600 students of B.A. part I classes of a college gave the following report. "Out of 600 students, 307 took economics, 198 took history, 230 took sociology, 65 took history and econimics, 45 took economics and sociology, 31 took sociology and history and 10 took all the three subjects. The report sounded very impressive, but the surveyor was fired. Why ?

Watch Video Solution

67. Let A, B, C be subsets of the universal set U. If $n(U) = 692, n(B) = 230, n(C) = 370, n(B \cap C) = 20, n(A \cap B' \cap C') =$, find $n(A' \cap B' \cap C')$.

Watch Video Solution

68. If the set A contains 5 elements, then the number of elements in the power set P(A) is equal to

A. 32

B. 36

C. 25

D. 40

Answer: A

Watch Video Solution

69. Given A={x:x is a root of $x^2 - 1 = 0$},B={x:x is a root of $x^2 - 2x + 1 = 0$} then (a)$A \cap B = B$(b)$A \cap B = A$(c) $A \cup B = A$(d) $A \cap B = \phi$

A. $A \cap B = B$

B. $A \cap B = A$

C. $A \cup B = A$

D. $A \cap B = \phi$

Answer: C

Watch Video Solution

70. Let S = {1,2,3,4}. The total number of unordered pairs of disjoint subsets of S is equal to

A. 26

B. 34

C. 42

D. 41

Answer: D

Watch Video Solution

71. 25 people for programme A, 50 people for programme B, 10 people for both. So, number of employee employed only A is

A. 15

B. 20

C. 35

D. 40

Answer: A

Watch Video Solution

72. Let $X = \{1, 2, 3, 4, 5\}$. The number of different ordered pairs (Y, Z) that can be formed such that $Y \subseteq X$, $Z \subseteq X$ and $Y \cap Z$ is empty, is (1) 5^2 (2) 3^5 (3) 2^5 (4) 5^3

A. 5^2

B. 3^5

C. 2^5

D. 5^3

Answer: B

Watch Video Solution

Problem Set 2 Relations

1. If R is a relation from a finite set A having m elements to a finite set B having n elements then the number of relations from A to B is 2^{mn} b.

$2^{mn} - 1$ c. . d. m^n

A. 2^{mn}

B. $2^{mn} - 1$

C. $2mn$

D. m^n

Answer: A

Watch Video Solution

2. Let R be a reflexive relation on a finite set A having n elements, and let there be m ordered pairs in R. Then

A. $m \geq n$

B. $m \leq n$

C. $m = n$

D. none of these

Answer: A

Watch Video Solution

3. Two points A and B in a plane are related if OA = OB, where O is a fixed point. This relation is

A. partial order relation

B. equivalence relation

C. reflexive but not symmetric

D. reflexive but not transitive

Answer: B

Watch Video Solution

4. Let A and B be two sets such that $A \times B$ consists of 6 elements. If three elements of $A \times B$ are: $(1, 4), (2, 6), (3, 6)$. Find

$A \times B$ and $B \times A$.

Watch Video Solution

5. If $A = \{a, b, c, d\}, B = \{1, 2, 3\}$, find whether or not the following sets of orderd pairs are relations from A to B or not

$R_1 = \{(a, 1), (a, 3)\}$

Watch Video Solution

6. If $A = \{a, b, c, d\}, B = \{1, 2, 3\}$, find whether or not the following sets of orderd pairs are relations from A to B or not

$R_2 = \{(b, 1), (c, 2), (d, 1)\}$

Watch Video Solution

7. If $A = \{a, b, c, d\}, B = \{1, 2, 3\}$, find whether or not the following sets of orderd pairs are relations from A to B or not

$R_3 = \{(a, 1), (b, 2), (3, c)\}$

Watch Video Solution

8. If $A = \{1, 2, 3, 4\}$ define relations on A which have properties of being reflexive, transitive but not symmetric.

Watch Video Solution

9. If $A = \{1, 2, 3, 4\}$ define relations on A which have properties of being symmetric but neither reflexive nor transitive.

Watch Video Solution

10. If $A = \{1, 2, 3, 4\}$ define relations on A which have properties of being reflexive, symmetric and transitive.

Watch Video Solution

11. Let $A = \{1, 2, 3\}$ and let

$R_1 = \{(1, 1), (1, 3), (3, 1), (2, 2), (2, 1), (3, 3)\}$

$R_2 = \{(2, 2), (3, 1), (1, 3)\}$

$R_3 = \{(1, 3), (3, 3), R_4 = A \times A$

Find whether or not each of the relations R_1, R_2, R_3, R_4, on A is

(a) reflexive (b) symmetric

(c) transitive

Watch Video Solution

12. Given the relation R= {(1,2), (2,3)} on the set of natural numbers, add a minimum of ordered pairs so that the enlarged relation is symmetric, transitive and reflexive.

Watch Video Solution

13. Given the relation $R = \{(1, 2)(2, 3)\}$ on the set $A = \{(1, 2, 3)\}$ the minimum number of ordered pairs which when added to R make it an

equivalence relation is

A. 5

B. 6

C. 7

D. 8

Answer: C

Watch Video Solution

14. Let $R = \{(a, a), (b, c), (a, b)\}$ be a relation on a set $A = \{a, b, c\}$. Then the minimum number of ordered pairs which when added to R make it an equivalence realtion are ...

Watch Video Solution

15. Is it true that every relation which is symmetric and transitive is also reflexive? Give reasons.

Watch Video Solution

16. Let a relation R be defined by

$R = \{(4, 5), (1, 4), (4, 6), (7, 6), (3, 7)\}$. Find

R o R

Watch Video Solution

17. Let a relation R be defined by

$R = \{(4, 5), (1, 4), (4, 6), (7, 6), (3, 7)\}$. Find

R^{-1} o R

Watch Video Solution

18. If R be a relation from $A = \{1, 2, 3, 4\}$ to $B = \{1, 3, 5\} i.e., (a, b) \in R \Leftrightarrow a < b,$ then Ro R^{-1} is

A. $\{(1, 3), (1, 5), (2, 3), (2, 5), (3, 5), (4, 5)\}$

B. $\{(3, 1), (5, 1), (3, 2), (5, 2), (5, 3), (5, 4)\}$

C. $\{(3, 3), (3, 5), (5, 3), (5, 5)\}$

D. $\{(3, 3), (3, 4), (4, 5)\}$

Answer: C

Watch Video Solution

19. If $X = \{1, 2, 3, 4, 5)$ and $Y = \{1, 3, 5, 7, 9\}$, determine which of the following are relations from X to Y.

(a) $R_1 = \{(x, y) : y = x + 2, x \in X, y \in Y\}$

(b) $R_2 = \{(1, 1), (2, 1), (3, 3), (4, 3), (5, 5)\}$

(c) $R_3 = \{(1, 1), (1, 3), (3, 5), (3, 7), (5, 7)\}$

(d) $R_4 = \{(1, 3), (2, 5), (4, 7), (5, 9), (3, 1)\}$

Watch Video Solution

20. Let A be the set of first ten natural nnumbers and let R be relation on A defined by $(x, y) \in R' x + 2y = 10$, i.e. $R = \{(x, y) : x \in A \text{ and } x + 2y = 10\}$. Express R and R^{-1} as sets of ordered pairs. Determine also (i) domains of R and R^{-1} (ii) ranges of R and R^{-1}.

Watch Video Solution

21. Three relations R_1, R_2 and R_3 are defined on set $A = \{a, b, c\}$ as follows :

$R_1 = \{(a, a), (a, b), (a, c), (b, c), (c, a), (b, b), (c, b), (c, c)\}$

Discuss each of them from the point of view of being reflexive, symmetric and transitive.

Watch Video Solution

22. Three relations R_1, R_2 and R_3 are defined on set $A = \{a, b, c\}$ as follows :

$R_2 = (\{a, b), (b, a), (a, c), (c, a)\}$

Discuss each of them from the point of view of being reflexive, symmetric and transitive.

Watch Video Solution

23. Three relations R_1, R_2 and R_3 are defined on set $A = \{a, b, c\}$ as follows :

$R_3 = \{(a, b), (b, c), (c, a)\}$

Discuss each of them from the point of view of being reflexive, symmetric and transitive.

Watch Video Solution

24. Let R be a relation from a set $A \rightarrow$ a set B, then $R = A \cup B$ b. $R = A \cap B$ c. $R \subseteq A \times B$ d. $R \subseteq B \times A$

A. $R = A \cup B$

B. $R = A \cap B$

C. $R \subseteq A \times B$

D. $R \supseteq B \times A$

Answer: C

Watch Video Solution

25. Let $A = (1, 2, 3, 4\}$, and let $R = \{(2, 2), (3, 3), (4, 4), (1, 2)\}$ be a relation on A. Then R is

A. reflexive

B. symmetric

C. transitive

D. none of these

Answer: C

Watch Video Solution

26. If A={a,b,c,d},B=(p,q,r,s), then which of the following are relations from A to B ? Give reasons for your answer :

A. $R_1 = \{(a, p), (b, r), (c, s)\}$

B. $R_2 = \{q, b), (c, s), (d, r)\}$

C. $R_3 = \{(a, p), (a, q), (d, p), (c, r), (b, r)\}$

D. $R_4 = \{(a, p), (q, a), (b, s), (s, b)\}$

Answer: A::C

Watch Video Solution

27. A relation R is defined on the set Z of integers as: $(x, y) \in Rx^2 + y^2 = 25$. Express $RandR^{-1}$ as the sets of ordered pairs and hence find their respective domains.

Watch Video Solution

28. Let R be a relation on I (the ste of integers) defined as m R n $(m, n \in I)$ iff $m \leq n$. Check R for reflexivity, symmetry, transitivity and anti-symmetry.

Watch Video Solution

29. Let R be a relation defined by R = {(a, b) : $a \geq b$}, where a and b are real numbers, then R is

A. Reflexive, symmetric and transitive.

B. Reflexive, transitive but not symmetric.

C. Symmetric, transitive but not reflexive.

D. Neither transitive nor reflexive but symmetric.

Answer: B

Watch Video Solution

30. The relation R defined in N as $aRb \Rightarrow b$ is divisible by a is

A. reflexive but not symmetric

B. symmetric but not transitive

C. symmetric and transitive

D. none of these

Answer: A

Watch Video Solution

31. 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.

A. reflexive and symmetric

B. reflexive and transitive

C. symmetric and transitive

D. equivalence relation

Answer: B

Watch Video Solution

32. If α, β be straight lines in a plane, then check R_1 and R_2 for being reflexive, symmetric and transitive $\alpha R_1 \beta$ if $\alpha \perp \beta$ and $\alpha R_2 \beta$ if $\alpha \| \beta$.

Watch Video Solution

33. Let n be a fixed positive integer. Define a relation R on I (the set of all intergers) as follows :

aRB iff n / (a - b), that is iff a - b is divisible by n. Show that R is an equivalence relation on I.

Watch Video Solution

34. Consider the non-empty set consisting of children in a family. State giving reason whether each of the following relations is (i) Symmetric (ii) Transitive

x is a brother of y.

Watch Video Solution

35. Consider the non-empty set consisting of children in a family. State giving reason whether each of the following relations is (i) Symmetric (ii) Transitive

x likes y

Watch Video Solution

36. Let S be the set of all points in a plane. Let R be a relation on S such that for any two points a and b, a R b iff b is within 1 centimetre from a. Check R for reflexivity, symmetry and transitivity.

Watch Video Solution

Watch Video Solution

37. N is the set of natural numbers. The relation R is defined on $N \times N$ as follows (a,b) R (c, d)' a + d = b + c Prove that R is an equivalence relation.

Watch Video Solution

38. N is the set of positive intergers and ~ be a relation on $N \times N$ defined (a, b) ~ (c, d) iff ad = bc.

Check the relation for being an equivalence relation.

Check the relation in Q. 31, 32 for R, S, T.

View Text Solution

39. The following relation is defined on the set of real numbers. A R b iff $|a - b| > 0$.

Watch Video Solution

40. If R be a relation a R b if $1 + ab > 0$. What about equivalence relation ?

Watch Video Solution

41. A relation R on the set of complex numbers is defined by $z_1 R z_2$ if and oly if $\frac{z_1 - z_2}{z_1 + z_2}$ is real Show that R is an equivalence relation.

Watch Video Solution

42. 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

43. On the set of all points in a plane, the relation defined by the phrase 'at the same distance from the origin' is an equivalence relation.

A. True

B. False

C.

D.

Answer: A

Watch Video Solution

44. A function R on the set N of natural numbers is defined as $R = \{[2n, 2n+1] : n \in N\}$

The domain of R ...

Watch Video Solution

45. A relation f on the set N of natural numbers is defined by $f = \{(n, n+3) : n \in N\}$

The range of f = N - ....

Watch Video Solution

46. Consider the following relations: R = {(x, y) | x, y are real numbers and x = wy for some rational number w}; $S = \left\{\left(\frac{m}{n}, \frac{p}{q}\right) \mathrm{m}, \mathrm{n}, \mathrm{pandqa\ r\ ei\ n\ t\ e\ g\ e\ r\ ss\ u\ c\ ht\ h\ a\ tn}, \mathrm{q} \neq 0\mathrm{andq\ m} =$. Then (1) neither R nor S is an equivalence relation (2) S is an equivalence relation but R is not an equivalence relation (3) R and S both are equivalence relations (4) R is an equivalence relation but S is not an equivalence relation

A. R is equivalence but S is not an equivalence

B. neither R nor S is an equivalence relation

C. S is equivalence but R is not

D. R and S both are equivalence

Answer: C

Watch Video Solution

47. Let R be the set of real numbers.

Statement 1:$A = \{(x, y) \in R \times R : y - x$ is an integer$\}$ is an equivalence relation on R.

Statement 2: $B = \{x, y\} \in R \times R : x = \alpha y$ for some rational number $\alpha\}$ is an equivalence relation on R.

Watch Video Solution

Problem Set 3 Functions And Mapping

1. Given $A = \{2,\ 3,\ 4\}$, $B = \{2,\ 5,\ 6,\ 7\}$. Construct an example of an injective map from A to B .

Watch Video Solution

2. Given $A = \{2,\ 3,\ 4\}$, $B = \{2,\ 5,\ 6,\ 7\}$. Construct an example of a mapping from A to B which is not injective

Watch Video Solution

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

Construct an example of each of the following

a mapping from B to A.

Watch Video Solution

4. If $A = \{1, 2, 3, 4\}$, then which of the following are functions from A to itself?

A. $f_1 = \{(x, y) : y = x + 1\}$

B. $f_2 = \{(x, y) : x + y > 4\}$

C. $f_3 = \{(x, y) : y < x\}$

D. $f_4 = \{(x, y) : x + y = 5\}$

Answer: D

Watch Video Solution

5. Suppose f is the collection of all ordered pairs of real numbers and x=6 is the first element of some ordered pair in f. Suppose the vertical line through x=6 intersects the graph off twice. Is f a function ? Why or why not?

Watch Video Solution

6. 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

7. Is the function f:$N \to N$ (N is set of the natural numbers) defined by f(n) = 2n +3 for all $n \in N$ surjective ?

Watch Video Solution

8. Are the following sets of ordered pairs functions? If so, examine whether the mapping is surjective or injective:

{(x, y):x is a person, y is the mother of x}

Watch Video Solution

9. Are the following sets of ordered pairs functions ? If so, examine whether the mapping is surjective or injective :

{(a, b) : a is a person, b is an ancestor of a}

Watch Video Solution

10. If the mapping f and g are given by

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

and g = {(2, 3), (5, 1), (1, 3)},

write down pairs in the mapping fog and gof.

Watch Video Solution

11. If the functions $f: R \to R$ and $g: R \to R$ be defined by $f(x) = 2x + 1, g(x) = x^2 - 2$. Find the formulae for g o f and f o g.

Watch Video Solution

12. Let R be the set of all real numbers let $f: R \to R: f(x) = \sin x$ and $g: R \to R: g(x) = x^2$. Prove that g o f $\neq$ f o g

Watch Video Solution

13. Let $f: R \to R, g: R \to R$ be two functions given by $f(x) = 2x - 3, g(x) = x^3 + 5$. Then $(fog)^{-1}$ is equal to

A. $\left(\frac{x+7}{2}\right)^{1/3}$

B. $\left(x - \frac{7}{2}\right)^{1/3}$

C. $\left(\frac{x-2}{7}\right)^{1/3}$

D. $\left(\frac{x-7}{2}\right)^{1/3}$

Answer: D

Watch Video Solution

14. If $f(x) = \frac{3x+2}{5x-3}$, then

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

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

C. $(fof)(x) = -x$

D. $f^{-1}(x) = -\frac{1}{19}f(x)$

Answer: A

Watch Video Solution

15. Given $f(x) = \log_{10}\left(\frac{1+x}{1-x}\right)$ and $g(x) = \frac{3x + x^3}{1 + 3x^2}$, then fog(x) equals

A. $-f(x)$

B. $3f(x)$

C. $[f(x)]^3$

D. none of these

Answer: B

Watch Video Solution

16. Let $f: R \to R$ be defined by $f(x) = \cos(5x + 2)$. If f invertible ?

Watch Video Solution

17. A mapping is defined as f:$R \to R$. f (x) = cos x. Show that it is neither one-one nor surjective.

Watch Video Solution

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

Watch Video Solution

19. Let $A = R - \{3\}, B = R - \{1\}$ and $f: A \to B$ defined by $f(x) = \frac{x-2}{x-3}$. Is 'f' bijective? Give reasons.

Watch Video Solution

20. Let f: $R \to R$ be defined by $f(x) = 3x + 4, X \in R$ Is f invertible ? If so, give a formula for f^{-1}.

Watch Video Solution

21. The composite mapping fog of the maps $f: R \to R, f(x) = \sin x$ and $g: R \to R, g(x) = x^2$, is

A. $\sin x + x^2$

B. $(\sin x)^2$

C. $\sin x^2$

D. $\frac{\sin x}{x^2}$

Answer: C

Watch Video Solution

22. Let A and B be two sets with a finite number of elements. Assume that there is injective mapping from A to B and that there is an injective mapping from B to A. Prove that there is a bijective mapping from A to B.

Watch Video Solution

23. If $f: R \to R$ is defined by $f(x) = x^2 + 1$, then values of $f^{-1}(17)$ and $f^{-1}(-3)$ respectively are

A. $\phi\{4, -4\}$

B. $\{3, -3\}\phi$

C. $\phi\{3, -3\}$

D. $\{4, -4\}\phi$

Answer: D

Watch Video Solution

24. Which of the statements given below is different from the other?

A. $f: A \to B$

B. $f: x \to f(x)$

C. f is a mapping of A into B

D. f is a function of A into B

Answer: A::B::C::D

Watch Video Solution

25. Find the domain and range of $f(x) = x^2 / \left(1 + x^2\right)$(x real). Is the function one-to-one ?

Watch Video Solution

26. If $A = \{x: -1 \leq x \leq 1\}$ and f be a function on A. Discuss the following functions w.r.t. one-one-onto bijective .

$f(x) = \frac{x}{2}$

Watch Video Solution

27. If $A = \{x : -1 \leq x \leq 1\} = B$. Discuss the following functions w.r.t. one-one-onto bijective and write their characteristics.

$g(x) = |x|$

Watch Video Solution

28. Let $f : A \to A$ where $A = \{x : -1 \leq x \leq 1\}$. Find whether the following function are bijective

$x|x|$

Watch Video Solution

29. If $f : A \to A, A = \{x : -1 \leq x \leq 1\} = B$. Discuss the following functions w.r.t. one-one-onto bijective .

$f(x) = x^2$

Watch Video Solution

30. If $f: A \to A, A = \{x: -1 \leq x \leq 1\} = B$. Discuss the following functions w.r.t. one-one-onto bijective.

$f(x) = \sin \pi x$

Watch Video Solution

31. Set A has 3 elements and set B has 4 elements. The number of injections that can be defined from A to B is

A. 144

B. 12

C. 24

D. 64

Answer: C

Watch Video Solution

32. The number of surjections from A={1,2,... n}, $n \geq 2,$ onto B = {a,b} is

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

B. $2^{n} - 2$

C. $2^{n} - 1$

D. none of these

Answer: B

Watch Video Solution

33. Let A and B be two finite sets having m and n elements respectively. Then the total number of mappings from A to B is

A. mn

B. 2^{mn}

C. m^n

D. n^m

Answer: D

Watch Video Solution

34. The total number of injective mappings from a set with melements to a set with n elements, m $\leq$ n, is

A. m^n

B. n^m

C. $\frac{n!}{(n-m)!}$

D. n!

Answer: C

Watch Video Solution

35. Let A be a set containing 10 distinct elements, then the total number of distinct functions from A to A is

A. 101

B. 10^{10}

C. 2^{10}

D. $2^{10} - 1$

Answer: B

Watch Video Solution

36. If the mappings f :$A \to B$and g: $B \to C$ are both bijective, then the mapping gof: A $\to$ C is also bijective.

A. true B. False

A. True

B. False

C.

D.

Answer: A

Watch Video Solution

37. Let E = {1,2,3,4} and F {1,2}. Then the number of onto functions from E to F is

A. 14

B. 16

C. 6

D. 4

Answer: A

Watch Video Solution

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

A. True B. False

A. True

B. False

C.

D.

Answer: A

Watch Video Solution

39. Let f be an injective map with domain {x,y,z) and range {1,2,3} such that exactly one of the following statements is correct and the remaining are false : $f(x) = 1, f(y) \neq 1, f(z) \neq 2$. The value of f^{-1} (1) is

A. x

B. z

C. y

D. none of these

Answer: B

Watch Video Solution

Self Assessment Test

1. Three sets A, B, C are such that $A = B \cap C$ and $B = C \cap A$, then

A. $A \subset B$

B. $A \supset B$

C. $A = B$

D. $A \subset B'$

Answer: C

Watch Video Solution

2. If $n(A) = 4, n(B) = 3, n(A \times B \times C) = 24$, then n(C) equals

A. 12

B. 1

C. 17

D. 2

Answer: D

Watch Video Solution

3. Which of the following is a true statement ?

A. $\{a\} \in \{a, b, c\}$

B. $\{a\} \subset \{a, b, c\}$

C. $\phi \in \{a, b, c\}$

D. None of these

Answer: B

Watch Video Solution

4. Prove that the relation "less than" in the set of natural number is transitive but not reflexive and symmetric.

A. only symmetric

B. only transitive

C. only reflexive

D. None of these

Answer: B

Watch Video Solution

5. The number of reflexive relations of a set with four elements is equal to

A. 2^{11}

B. 2^4

C. 2^{13}

D. 2^8

Answer: B

Watch Video Solution

6. $R \subseteq A \times A$ (where $A \neq 0$) is an equivalence relation if R is

A. Reflexive, symmetric but not transitive

B. Reflexive, neither symmetric not transitive

C. Reflexive, symmetric and transitive

D. None of these

Answer: C

Watch Video Solution

7. $If A = \{x, y) : x^2 + y^2 = 25\}$ and

$B = \{(x, y) : x^2 + 9y^2 = 144\}$, then $A \cap B$ contains

A. 1 point

B. 2 points

C. 3 points

D. 4 points

Answer: D

Watch Video Solution

8. If R and S be two non-void relations on a set A, which of the following statements if false?

A. R and S are transitive $\rightarrow R \cup S$ is transitive

B. R and S are transitive $\rightarrow R \cap S$ is transitive

C. R and S are symmetric $\rightarrow R \cup S$ is symmetric

D. None of these

Answer: A

Watch Video Solution

9. Let r be a relation from the set of real numbers R defined by $r = \{(a, b) : a, b \in ER)$ and $a - b + \sqrt{3}$ is an irrational number. Then relation r is

A. an equivalence relation

B. Reflexive

C. Symmetric

D. None of these

Answer: B

Watch Video Solution

10. Let $R = \{(3, 3), (6, 6), (9, 9), (12, 12), (6, 12), (3, 9(, (3, 12), (3, 6)\}$ be relation on the set $A = \{3, 6, 9, 12\}$. The relation is-

A. equivalence

B. reflexive and symmetric only

C. reflexive and transitive only

D. None of these

Answer: C

Watch Video Solution

11. If A and B two sets containing 2 elements and 4 elements, respectively. Then, the number of subsets of $A \times B$ having 3 or more elements, is

A. 256

B. 220

C. 219

D. 211

Answer: C

Watch Video Solution

12. Let $R = \{(3, 3), (6, 6), (9, 9), (12, 12), (6, 12), (3, 9(, (3, 12), (3, 6)\}$ be relation on the set $A = \{3, 6, 9, 12\}$. The relation is-

A. equivalence

B. reflexive and symmetric only

C. reflexive and transitive only

D. None of these

Answer: C

Watch Video Solution

13. If A and B two sets containing 2 elements and 4 elements, respectively. Then, the number of subsets of $A \times B$ having 3 or more elements, is

A. 256

B. 220

C. 219

D. 211

Answer: C

Watch Video Solution