MATHS

BOOKS - RS AGGARWAL MATHS (HINGLISH)

RELATIONS

Solved Examples

1. Let s be set of all in a plane and let R be a relation on s defined by

$\Delta_1 S \Delta_2 \Leftrightarrow \Delta_{11} \equiv \Delta_2.$ then ,R is

Watch Video Solution

2. Let A be the set of all lines in xy-plane and let R be relation in A , defind by

$R = \{(L_1, L_2) : L_1 \mid \mid L_2\}.$

show that R is an equivalence relation in A.

Find the set of all lines related to the line $Y = 3x + 5$.

Watch Video Solution

3. Let $R = \{(a, b) : a, b \in Z \text{ and } (a - b) \text{ is even}\}$.

Then, show that R is an equivalence relation on Z.

Watch Video Solution

4. Let L be the set of all lines in a plane and R be the relation in L defined as $R = \{(L_1, L_2) : (L_1 \text{ is perpendicular to } L_2)\}$. Show that R is symmetric but neither reflexive nor transitive.

Watch Video Solution

5. Let a relation R_1 on the set R of real numbers be defined as $(a, b) \in R_{11} + ab > 0$ for all $a, b \in R$. Show that R_1 is reflexive and symmetric but not transitive.

Watch Video Solution

6. Let S be the set of all real numbers and let R be a relation in s, defined

by

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

Show that R is reflexive and transitive but not symmetric .

Watch Video Solution

7. Let S be the set of all real numbers and let R be a relation in s,defined

by

$R = \{(a, b) : a \leq b^2\}.$

show that R satisfies none of reflexivity , symmetry and transitivity .

Watch Video Solution

8. Let S be the set of all real numbers and let R be relation in S, defied by

$R = \{(a, b) : a \leq b^3\}$.

Show that R satisfies none reflexivity , symmetry and transitivity .

Watch Video Solution

9. Let N be the set of all natural niumbers and let R be a relation in N , defined by

$R = \{(a, b) : a \text{ is a factor of b}\}$.

then , show that R is reflexive and transitive but not symmetric .

Watch Video Solution

10. Let N be the set of all natural numbers and let R be relation in N. Defined by

$R = \{(a, b) : \text{a is a multiple of b}\}$.

show that R is reflexive transitive but not symmetric .

Watch Video Solution

11. Let s be the set of all sets and let $R = \{(a, B) : a \subset B\}, i. e. , .$ A is a proper subset of B . Show that R is (i) Transitive (ii) Not reflexive (iii) not symmetric .

12. Give an example of a relation which is

(i) Reflexive and transitive but not symmetric,

(ii) symmetric and transitive but not Reflexive ,

(iii) reflexive and symmetric not transitive,

(iv) symmetric but neither reflexive nor transitive,

(v) transitive but neither reflexive nor symmetric.

13. Let N be the set of all natural numbers and let R be a relation on NxN, defined by $(a, b)R(c, d)ad = bc$ for all $(a, b), (c, d) \in NxN$.

Watch Video Solution

14. If R_1 and R_2 are equivalence relations in a set A, show that $R_1 \cap R_2$ is also an equivalence relation.

Watch Video Solution

15. Show that the union of two equivalence relations on a set is not necessarily an equivalence relation on the set.

Watch Video Solution

16. On the set Z of all integers , consider the relation

$R = \{(a, b) : (a - b)$ is divisible by $3\}$.

Show that R is an equivalence relation on Z.

Also find the partitioning of Z into mutually disjoint equivalence classes .

View Text Solution

17. Let $A = \{x \in Z : 0 \leq x \leq 12\}$.

show that $R = \{(a, b) : |a - b|$ is a multiple of 4 is

(i) reflexive, (ii) symmetric and (iii) transitive.

Find the set of elements related to 1.

Watch Video Solution

18. Let $A = \{1, 2, 3, \ldots, 9\}$ 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 $[2 \quad 5]$.

Watch Video Solution

Exercise 1 A

1. Find the domain and range of the relation $R = \{(-1, 1), (1, 1), (-2, 4), (2, 4)\}$.

Watch Video Solution

2. Let $R = \{(a, a^3) : a$ is a prime number less than $5\}$.

find the range of R .

Watch Video Solution

3. Let $R = \{(a, a^3) : a$ is a prime number less than 10}.

find (i) R (ii) dom (R) (iii) Range (R) .

Watch Video Solution

4. Let R=$\{x, y) : x + 2y = 8\}$ be a relation on N.

write the range of R.

Watch Video Solution

5. Let $R = \{(a, b) : a, b \in N \text{ and } a + 3b = 12\}$.

find the domain and range of R.

Watch Video Solution

6. Let $R = \{(a, b) : b = |a - 1|, a \in Z \text{ and } |a| < 3\}$.

Find the domain and range of R.

Watch Video Solution

7. Let $R = \left\{\left(a, \frac{1}{a}\right) : A \in N \text{ and } 1 < a < 5\right\}$.

Find the domain and range of R.

Watch Video Solution

8. Let $R = \{(a, b) : a, b \in N \text{ and } b = a + 5, a < 4\}$.

find the domain and range of R.

A. domain $(R) = \{1, 2, 3\}$ and range $(R) = \{6, 2, 8\}$

B. domain $(R) = \{1, 2, 3\}$ and range $(R) = \{6, 7\}$

C. domain $(R) = \{1, 2, 3\}$ and range $(R) = \{6, 7, 8\}$

D. domain $(R) = \{2, 3\}$ and range $(R) = \{6, 7, 8\}$

Answer: C

Watch Video Solution

9. Let S be the set of all sets and let $R = \{(A, B) : A \subset B\}$,i.e., . A is a proper subset of B. Show that R is (i) Transitive (ii) Not reflexive (iii) not symmetric.

Watch Video Solution

10. Let A be the set of all points in a plane and let O be the origin Let $R = \{(p, q) : OP = OQ\}$. then, R is

Watch Video Solution

11. Show that the relation geq on the set R of all real numbers is reflexive and transitive but not symmetric.

Watch Video Solution

12. Let $A = (1, 2, 3, 4, 5, 6\}$ and $LetR = \{(a, b) : a, b \in A \text{ and } B = a + 1\}$.

Show that R is (i) not reflexive (ii) not symmetric and (iii) not transititve .

Watch Video Solution

Exercise 1 B

1. Let A and B be two nonempty sets.

(i) What do you mean by a relation from A to B?

(ii) What do you mean by the domain and range of a relation?

Watch Video Solution

2. Let A be the set of all triangles in a plane show that the relation

$R = \{(\Delta_1, \Delta_2) : \Delta_1 \sim \Delta_2\}$ is an equivalence relation on A .

Watch Video Solution

3. Let Z be the set of integers. Show that the relation

$R = \{(a, b) : a, b \in Z$ and $a + b$ is even$\}$ is an equivalence relation on Z.

Watch Video Solution

4. Let R ={(a, b):a,b in Z and (a-b) is divisible by 5 }. Show that R is an equivalence relation on Z.

Watch Video Solution

5. show that R is an equivaence relation R defined on the set $S = \{1, 2, 3, 4, 5\}$ given by $R = \{(a, b) : |a - b|$ is even } is an equivalence relation .

Watch Video Solution

6. Prove that the relation R on the set $N \times N$ defined by $(a, b)R(c, d)a + d = b + c$ for all $(a, b), (c, d) \in N \times N$ is an equivalence relation.

Watch Video Solution

7. Let S be the set of all rest numbers and lets

$R = \{(a, b): a, b \in S \text{ and } a = \pm b\}$.

Show that R is an equivalence relation on S.

Watch Video Solution

8. Let S be the set of all points in a plane and let R be a relation in S defined by $R = \{(a, b): d(A, B) < 2units\}$ where $d(A, B)$ is the distance between the points A and B.

Show that R is reflexive and symmetric but not transitive.

View Text Solution

9. Let S be the set of all real numbers sjow that the relation $R = \{(a, b): a^2 + b^2 = 1\}$ is symmetric but neither reflextive nor transitive .

Watch Video Solution

10. Let $R = \{(a, b) : a, b \in N \text{ and } a = b^2\}$, Show that R satisfies none of reflexivity, symmetry and transitivity.

Watch Video Solution

11. Let $R = \{(a, b) : a, b \in N, a > b\}$.

Show that R is a binary relation which is neither reflexive, nor symmetric.

Show that R is transitive.

Watch Video Solution

12. Let $A = \{1, 2, 3\}$ and $R = \{(1, 1), (2, 2), (3, 3), (1, 2), (2, 3)\}$.

show that R is reflexive but neither symmetric nor transitive .

Watch Video Solution

13. Let

$A = \{1, 2, 3, 4\}$ and $R = \{(1, 1), (2, 2), (3, 3), (4, 4), (1, 2), (1, 3), (3, 2)\}$.

show that R is reflexive and transitive but not symmetric .

Watch Video Solution

Objective Questions

1. Let

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

then R is

A. Reflexive and symmetric but transitive

B. Reflexive and transitive but not symmetric

C. symmetric and transitive but not reflexive

D. An equivalence relation

Answer: B

Watch Video Solution

2. $Let A = \{a, b, c\}$ and $Let R = \{(a, a), (a, b), (b, a)\}. then, R is$

A. Reflexive and symmetric but transitive

B. Reflexive and transitive but not symmetric

C. symmetric and transitive but not reflexive

D. An equivalence relation

Answer: C

Watch Video Solution

3. Let

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

then ,R is

A. Reflexive and symmetric but transitive

B. symmetric and transitive but not reflexive

C. Reflexive and transitive but not symmetric

D. An equivalence relation

Answer: A

Watch Video Solution

4. Let L be the set of all lines in a plane and let R be a relation defined on L by the rule $(x, y) \varepsilon R \to x$ is perpendicular to y. Then

A. Reflexive

B. Symmetric

C. Transitive

D. An equivalence relation

Answer: B

Watch Video Solution

5. Let S denote set of all integers. Define a relation R on $S : aRb$ if $ab \geq 0$ where $a, b \in S$. Then R is :

A. Reflexive and symmetric but not transitive

B. Reflexive and transitive but not symmetric

C. symmetric and transitive but not reflexive

D. An equivalence relation

Answer: D

Watch Video Solution

6. Let $\mathbb{Z}$ be the set of all integers and let R be a relation on $\mathbb{Z}$ defined by $aRb \Leftrightarrow (a-b)$ is divisible by 3. then $.R$ is

A. Reflexive and symmetric but transitive

B. Reflexive and transitive but not symmetric

C. symmetric and transitive but not reflexive

D. An equivalence relation

Answer: D

Watch Video Solution

7. Let R be a relation on the set N of naturalnumbers defined by $nRm \Leftrightarrow n$ is a factor of m(ie. nim) Then R is

A. Reflexive and symmetric but transitive

B. Reflexive and transitive but not symmetric

C. symmetric and transitive but not reflexive

D. An equivalence relation

Answer: B

Watch Video Solution

8. Let Z be the set of all integers and let R be a relation on Z defined by $aRb \Rightarrow a \geq b$. then R is

A. symmetric and transitive but not reflexive

B. Reflexive and symmetric but not transitive

C. Reflexive and transitive but not symmetric

D. An equivalence relation

Answer: C

Watch Video Solution

9. Let S be the set of all real numbers and Let R be a relations on s defined by $aRB \Leftrightarrow |a| \leq b.$ then ,R is

A. Reflexive and symmetric but transitive

B. symmetric and transitive but not reflexive

C. Reflexive and transitive but not symmetric

D. None of these

Answer: D

Watch Video Solution

10. Let S be set of all real numbers and let R be relation on S, defined by $aRb \Leftrightarrow |a-b| \leq 1.$ then R is

A. Reflexive and symmetric but transitive

B. Reflexive and transitive but not symmetric

C. symmetric and transitive but not reflexive

D. An equivalence relation

Answer: A

Watch Video Solution

11. Let S be the set of all real numbers. Then the relation $R = \{(a, b) : 1 + ab > 0\}$ on S is

A. Reflexive and symmetric but transitive

B. Reflexive and transitive but not symmetric

C. symmetric and transitive but not reflexive

D. None of these

Answer: A

Watch Video Solution

12. Let s be set of all Δ in a plane and let R be a relation on s defined by $\Delta_1 S \Delta_2 \Leftrightarrow \Delta_1 \equiv \Delta_2$. then ,R is

A. Reflexive and symmetric but transitive

B. Reflexive and transitive but not symmetric

C. symmetric and transitive but not reflexive

D. An equivalence relation

Answer: D

Watch Video Solution

13. Let S be set of all numbers and let R be a relation on S defined by $aRb \Leftrightarrow a^2 + b^2 = 1$ then, R is

A. symmetric and transitive but not reflexive

B. Reflexive and symmetric but transitive

C. Reflexive and transitive but not symmetric

D. None of these

Answer: D

Watch Video Solution

14. Let R be a relation over the set $N \times N$ and it is defined by $(a, b)R(c, d) \Rightarrow a + d = b + c$. Then R is

A. Reflexive and symmetric but transitive

B. Reflexive and transitive but not symmetric

C. symmetric and transitive but not reflexive

D. An equivalence relation

Answer: D

Watch Video Solution

15. Let A be the set of all points in a plane and let O be the origin Let $R = \{(p, q) : OP = OQ\}$. then ,R is

A. Reflexive and symmetric but not transitive

B. Reflexive and transitive but not symmetric

C. symmetric and transitive but not reflexive

D. An equivalence relation

Answer: D

Watch Video Solution

16. Let Q be the set of all rational numbers and * be the binary operation , defined by $a*b = a + ab$ for all $a, b \in Q$. then ,

A. * is commutative but not associative

B. *is Associative but not commmutative

C. * is neither commutative nor associative

D. * is both commutative and associative

Answer: C

Watch Video Solution

17. Let $a^*b = a + ab$ for all $a, b \in Q$. then

A. * is not a binary composition

B. * is not commutative

C. * is commutative but not associative '

D. * is both commutative and associative

Answer: B

Watch Video Solution

18. Let Q^+ be the set of all positive rationals then the operation * on Q^+ defined by a*b $= \frac{ab}{2}$ for all $a, b \in Q^+$ is

A. Commutative but not associative

B. Associative but not commmutative

C. Neiter commutative nor associative

D. Both commutative and accociative

Answer: D

Watch Video Solution

19. Let Z be the set of all integers and let a*b =a-b+ab . Then * is

A. Commutative but not associative

B. Associative but not commmutative

C. Neiter commutative nor associative

D. Both commutative and associative

Answer: C

Watch Video Solution

20. Let Z be the set of all integers, then , the operation * on Z defined by a*b=a+b-ab is

A. Commutative but not associative

B. Associative but not commmutative

C. Neiter commutative nor associative

D. Both commutative and accociative

Answer: D

Watch Video Solution

21. Let Z^+ be the set of all positive integers , then the operation * on Z^+ defined by $a*b = a^b$ is

A. Commutative but not associative

B. Associative but not commutative

C. Neither commutative nor associative

D. Both commutative and associative

Answer: C

Watch Video Solution

22. Define * on $Q-\{-1\}$ by a*b=a+b+ab then ,*on Q-{-1} is

A. Commutative but not associative

B. Associative but not commmutative

C. Neiter commutative nor associative

D. Both commutative and accociative

Answer: D

Watch Video Solution