AKSHYAJEE





LAKSHYA KO HAR HAAL ME PAANA HAI

Relations & Functions

Lecture: 02

KUNDAN KUMAR (B-Tech, IIT-BHU) 17+ years Teaching Experience



Today's Goal: :

Introduction of Relations:





Introductions of Relations:



x & represents r





Domain, Co-domain & Range of Relations:

Domain of a Relation:

The set of all first elements of the ordered pairs in a relation R form a set A to a set B is called the domain of the relation R.

Range of a Relation:

The set of all second elements in a relation R from a set A to a set B is called the range of the relation R. The whole set B is called the codomain of the relation R. Note that range is subset of codomain.

If
$$a = \pm 2 = 3$$
 b Not integer

If $a = \pm 3 \Rightarrow b$ not integer

If $a = \pm 4 \Rightarrow 5 = \pm 2$



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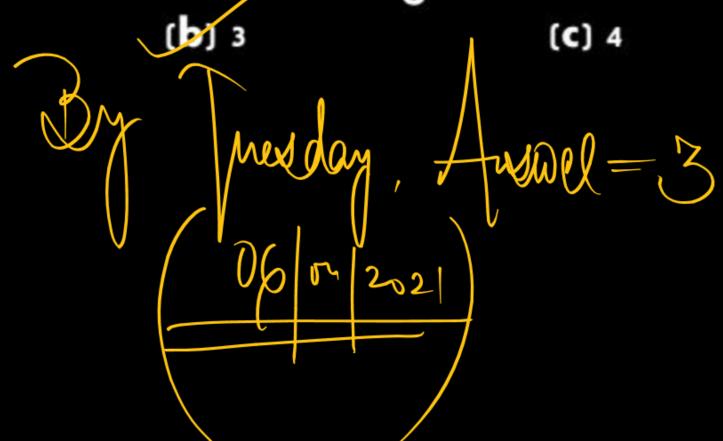
 $a^2 + 3b^2 = 28$; $a_1b \in \mathbb{Z}$



Problems based on Domain & Range:

Let $A = \{4, 5, 7\}$ and $B = \{2, 4, 6\}$ be two sets and let a relation R be a relation from A to B is defined as $R = \{(x, y) : x < y, x \in A, y \in B\}$, then the difference between the sum of elements of domain and range of R is-

(a) 2



(d) 5.





Empty / Void Relation - Number of null relation -

Let A be a set. Then $oldsymbol{o}$ subset of A imes A and so it is a relation on A. This relation is called the void or

empty relation on A.

eg.
$$A = \{1, 3, 5\}$$
 $P: A \rightarrow B$ is defined as $B = \{2, 4, 6\}$ $P: A \rightarrow B$ is defined as $P: A \rightarrow B$ is even, and $P: A \rightarrow B$ is even.

Universal Relation - no fumily relation = \ Will relation

Let A be a set. Then $A \times A \subset A \times A$ and so it is a relation on A. This relation is called the universal $A = \{1, 2\} \implies P = \{(1, 3), (2, 3)\} = A \times B$ relation on A.

Note:

The void and the universal relations on a set A are respectively the smallest and the largest relations of A.



Identity Relation:

Let A be a set. Then the relation $I_A = \{(a, a) : a \text{ is member of } A\}$ on A is called the identity relation on A.

In other words, a relation I_A on A is called the identity relation if every element of A is related to itself only.

$$A = \{(1,1), (1,2), (1,4)\}$$

$$A \times A = \{(1,1), (1,2), (1,4)\}$$

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

$$B = \{(1,1), (2,2), (4,4)\}$$

$$B = \{(1,1), (2,2), (4,4)\}$$

$$B = \{(1,1), (2,2), (4,4)\}$$





Reflexive Relation:

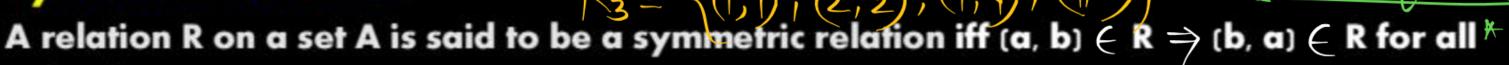
A relation R on set A is said to be reflexive if every element of A is related to itself.

Symmetric Relation:



$$\mathbb{R}_{2} = \{(1,1),(2,2),(4,4)\}$$

$$P_3 = \{(1,1), (2,2), (4,4), (4,2)\}$$



a,
$$b \in A$$

i.e. $aRb \Rightarrow bRa$ for all $a, b \in A$

$$= \left\{1, 2, 4\right\}$$

$$\frac{\mathbb{R}^{2}}{\mathbb{R}^{2}} \xrightarrow{\mathbb{R}^{2}} = \left\{ \left(1, 1 \right), \left(1, 2 \right) \right\}$$

$$\mathcal{P}_2 = \{(1,1)\}$$

$$\mathcal{R}_{3} = \{(1,1),(2,4)\}$$

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

of reflerive relations from



6. Transitive Relation:

Let A be any set. A relation R on A is said to be a transitive relation iff

 $(a, b) \in R$ and $(b, c) \in R \Rightarrow (a, c) \in R$ for all $a, b, c \in A$

i.e. aRb & bRc \Rightarrow aRc for all a, b, c \in A.

and bre = twen transitive then a RC

And bRC then a RC

rof transitive and by a lelation is francifive relation by default.



A's wife of B $= \{1, 2, 4\}$ A is fatuer of B $R: A \to A:$ $\{(1,1), (2,4)\}$ as of ixolated. A is father of B Bis Jahre of C but Ars not fatuer $= \{(1, 2)\}$ $\mathbb{R}_{1} = \left\{ \begin{pmatrix} 1, 2 \end{pmatrix}, \begin{pmatrix} 2, 4 \end{pmatrix}, \begin{pmatrix} 4, 1 \end{pmatrix} \right\}$ $\mathbb{R}_{2} = \left\{ \begin{pmatrix} 1, 4 \end{pmatrix}, \begin{pmatrix} 4, 1 \end{pmatrix} \right\}$ $\mathbb{R}_{3} = \left\{ \begin{pmatrix} 1, 4 \end{pmatrix}, \begin{pmatrix} 4, 1 \end{pmatrix} \right\}$ $\mathbb{R}_{3} = \left\{ \begin{pmatrix} 1, 4 \end{pmatrix}, \begin{pmatrix} 4, 1 \end{pmatrix} \right\}$ $\mathbb{R}_{3} = \left\{ \begin{pmatrix} 1, 4 \end{pmatrix}, \begin{pmatrix} 4, 1 \end{pmatrix} \right\}$ $\mathbb{R}_{3} = \left\{ \begin{pmatrix} 1, 4 \end{pmatrix}, \begin{pmatrix} 4, 1 \end{pmatrix} \right\}$ $\mathbb{R}_{3} = \left\{ \begin{pmatrix} 1, 4 \end{pmatrix}, \begin{pmatrix} 4, 1 \end{pmatrix} \right\}$ $\mathbb{R}_{3} = \left\{ \begin{pmatrix} 1, 4 \end{pmatrix}, \begin{pmatrix} 4, 1 \end{pmatrix} \right\}$ $\mathbb{R}_{3} = \left\{ \begin{pmatrix} 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Thank You Lakshyians