

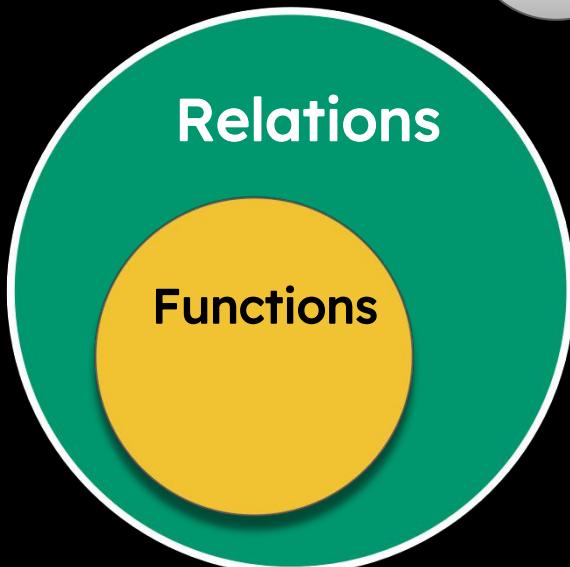


# Functions

LECTURE

1

Relations & Functions





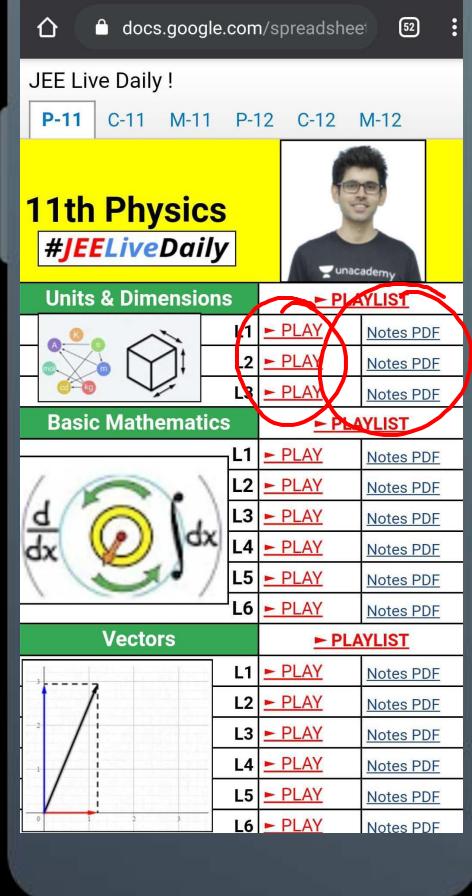
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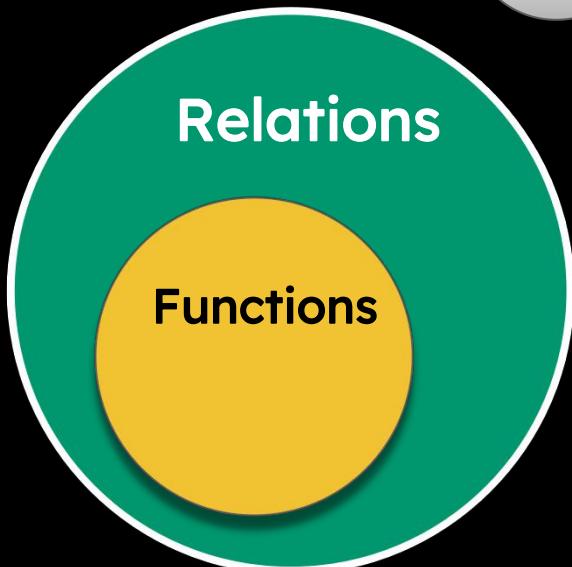


# Functions

LECTURE

1

Relations & Functions



# \* Important Terminologies ✓

## Ordered Pair

A pair of objects listed in a specific order is called an ordered pair.

**Example:** (Coordinates) of a point.

$P(1, 2)$  &  $Q(2, 1)$  are different points.

(a, b)

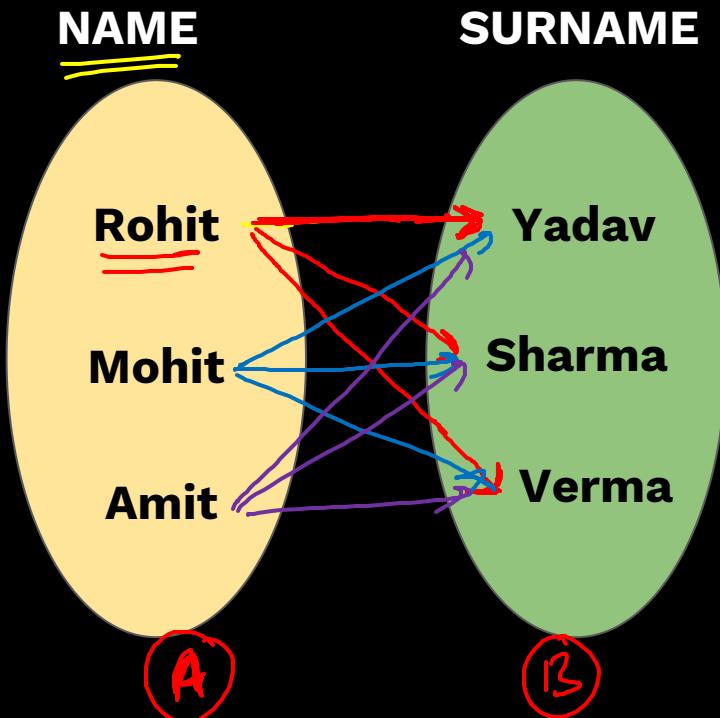
First  
element

Second  
element

# Important Terminologies

## Cartesian Product

\* = { (Rohit, Yadav), (Rohit, Sharma), -----  
----- . . . (Amit, Verma) }



# Important Terminologies

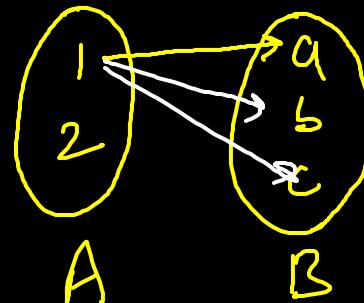
## Cartesian Product

The **SET** of **all possible** ordered pairs  $(a, b)$ , where  $a \in A$  and  $b \in B$  is called the cartesian product of A to B and is denoted by  $A \times B$ .

# Important Terminologies \*

## Example:

If  $A = \{1, 2\}$  and  $B = \{a, b, c\}$ ,  
then find  $A \times B$  and  $B \times A$



$$n(A) = 2$$

$$n(B) = 3$$

$$\boxed{n(A \times B) = 6}$$

$$A \times B = \left\{ \underset{=}{(1, a)}, (1, b), (1, c), (2, a), \underset{=}{(2, b)}, (2, c) \right\}$$

$$B \times A = \left\{ \underset{=}{(a, 1)}, (a, 2), (b, 1), \underset{=}{(b, 2)}, (c, 1), (c, 2) \right\}$$

**NOTE**

If  $n(A) = m$  and  $n(B) = n$ , then  $n(A \times B) = mn$ .

**Usually**  $A \times B \neq B \times A$ .

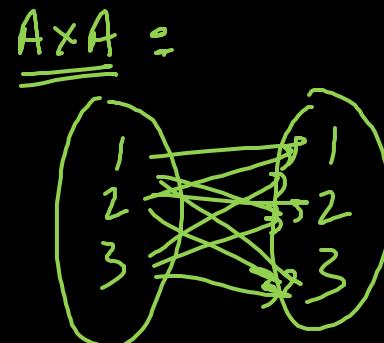
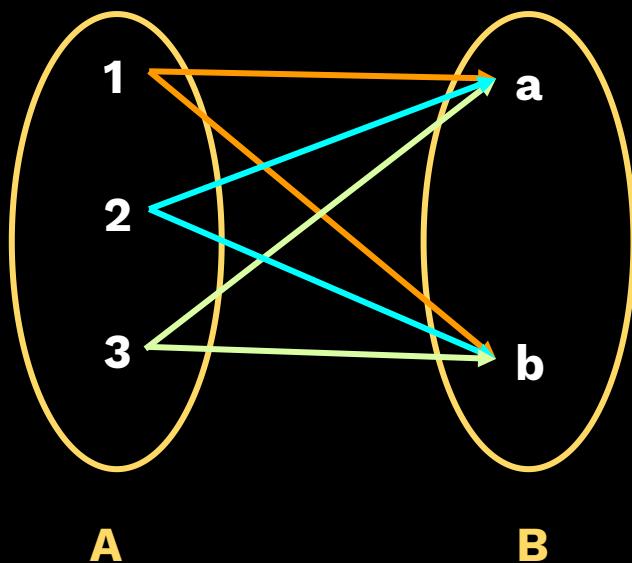
$$* A \times B = A \times B$$

$$\text{if } \boxed{A = B}$$

# Mapping Diagram (Arrow Diag.)

$A = \{ 1, 2, 3 \}$  and  $B = \{ a, b \}$

$A \times B = \{ (1, a), (1, b), (2, a), (2, b), (3, a), (3, b) \}$



# Relations



# Relation: Definition

## Relation:

SET

Let A and B be two sets. Then a relation R from A to B is a **subset of  $A \times B$** .

e.g.

if

$$A = \{1, 2, 3, 4, 5, 6, 7, 8, 9\} \text{ and}$$

$$B = \{1, 2, 3, 4, 5\}$$

and

$$R = \{(a, b) : a = 2b, a \in A, b \in B\} \text{ then}$$

$$R = \{(2, 1), (4, 2), (6, 3), (8, 4)\}.$$

$$R \subset (A \times B)$$



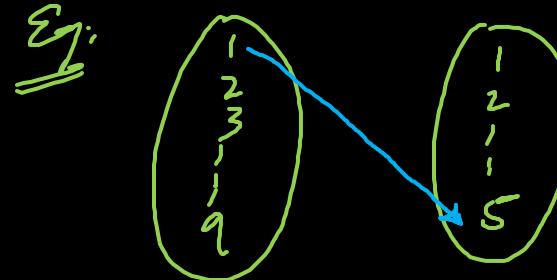
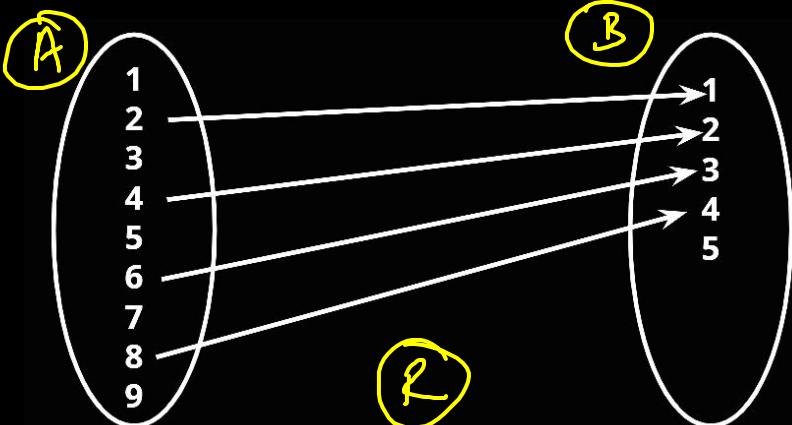
$$n(A \times B) = 9 \times 5$$

$$= 45$$

# Mapping Diagram of Relation

## Example:

✓  $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$  and  
 ✓  $B = \{1, 2, 3, 4, 5\}$   
 $R = \{(a, b) : a = 2b, a \in A, b \in B\}$   
 then  
 $R = \{(2, 1), (4, 2), (6, 3), (8, 4)\}.$



$$R = \{(1, 5)\}$$

$$R: A \rightarrow B$$

**NOTE**

If  $n(A) = m$  and  $n(B) = n$ , then  $n(A \times B) = mn$ .

So total number of subsets of  $A \times B$  i.e. number of relations from A to B is  $2^{mn}$ .

$$R: A \rightarrow B$$



Subset:  $\rightarrow [2^{m \times n}]$

(1  
2  
3)  
 $A$

(5  
6)  
 $B$

$R = \{(a,b); a \geq b\}$   
 $a \in A; b \in B$

# Domain & Range of A Relation



# Domain and Range

/ Codomain.

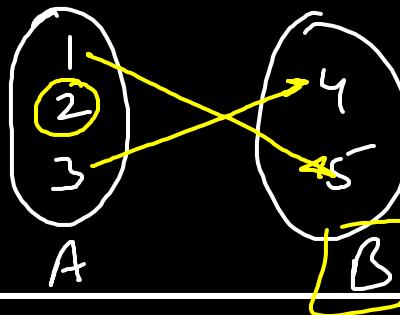
Let  $R : A \rightarrow B$

**Domain:**

The set of all first elements of the ordered pairs belonging to  $R$  is called the domain of  $R$ .

**Range:**

The set of all second elements of the ordered pairs in  $R$  is called the range of  $R$ .



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

$$\text{Domain} = \{1, 3\}$$

$$\text{Range} = \{4, 5\}$$



## Example

Let  $\underline{A} = \{1, 3, 5, 7\}$  and  $\underline{B} = \{2, 4, 6, 8\}$  be two sets and let  $R$  be a relation from  $A$  to  $B$  such that " $(x, y) \in R \Rightarrow x - y > 0$ ". Then find the Domain and Range of this relation

$A \times B$

$\equiv$

✓

$$R = \{(3, 2), (5, 2), (5, 4), (7, 2), (7, 4), (7, 6)\}$$

$x > y$  ✓

$$\text{Domain} = \{3, 5, 7\}$$

$$\text{Range} = \{2, 4, 6\}$$



## Example

Find the domain & range of the relation R given by

$$R = \{(x, y) : y = x + \frac{6}{x} ; \text{ where } x, y \in \mathbb{N} \text{ and } x < 6\}$$

$$R = \{(1, 7), (2, 5), (3, 5)\}$$

$$\text{Domain} = \{1, 2, 3\}$$

$$\text{Range} = \{5, 7\}$$

$$\boxed{y = x + \frac{6}{x}}$$

$$x=1 ; y=7$$

$$x=2 ; y=5$$

$$x=3 ; y=5$$

$$x=4 ; y=4 + \frac{3}{2}$$

$$x=5 ; y=5 + \frac{6}{5}$$

Class - 11<sup>th</sup>

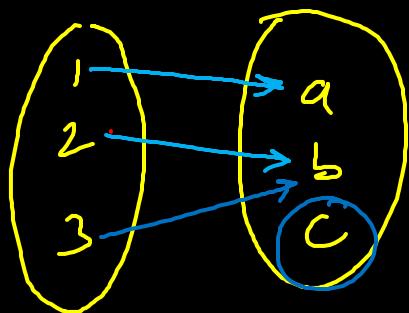
Sets → Relations → Function

# Functions



# \* Functions Definition

A function is a special case of relation where every element of 1st set (Domain) has one and only one output in 2nd set (Codomain).



[A]

[B]

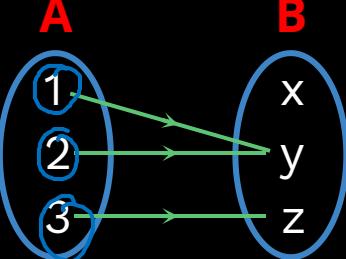
Domain  
(Input)  
n

Codomain  
(Output)  
f

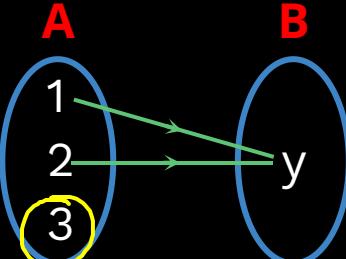
# Functions Mapping

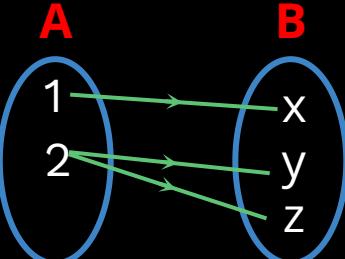
Example:

Identify Function Mapping

- 1) 

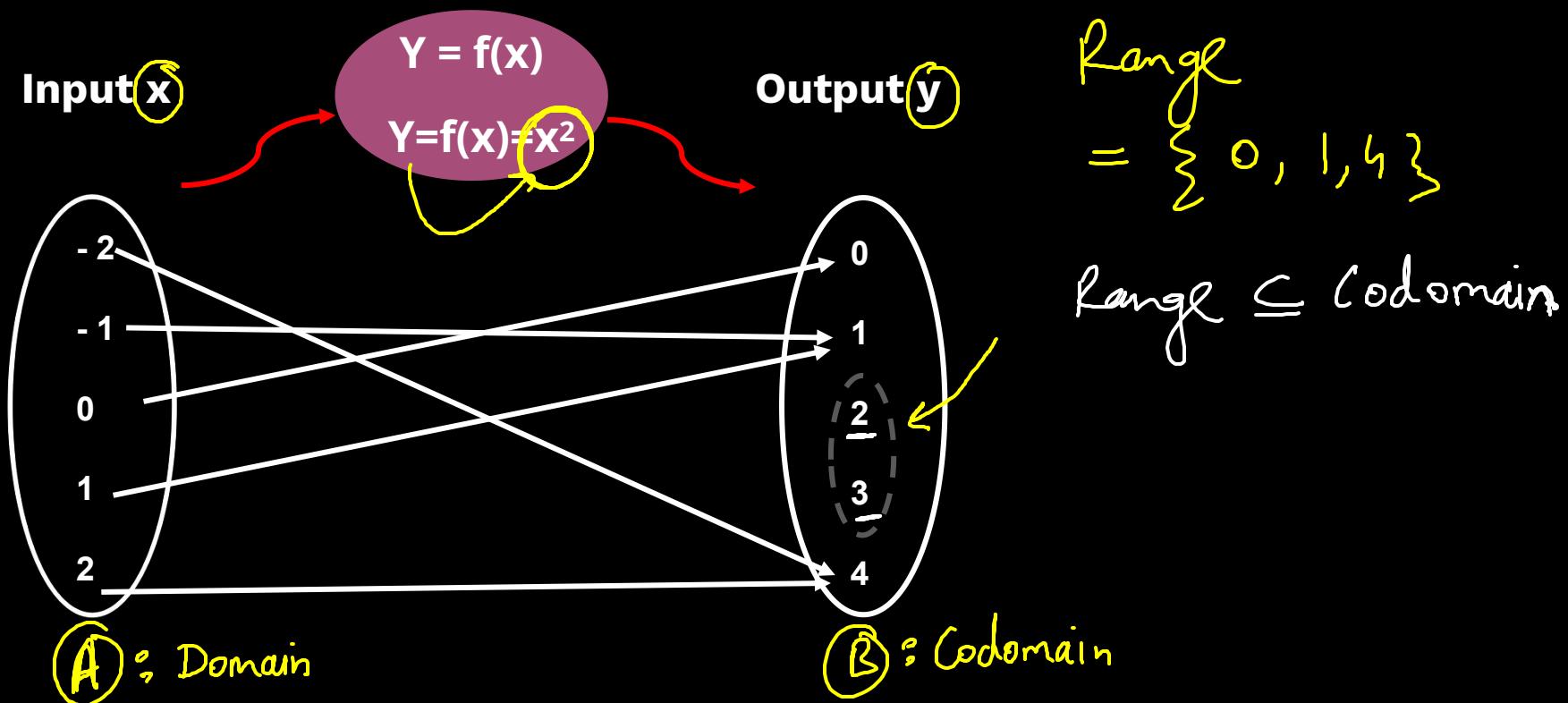
↓

( This is  
a function )
- 2) 

Not a function
- 3) 

This is a Relation

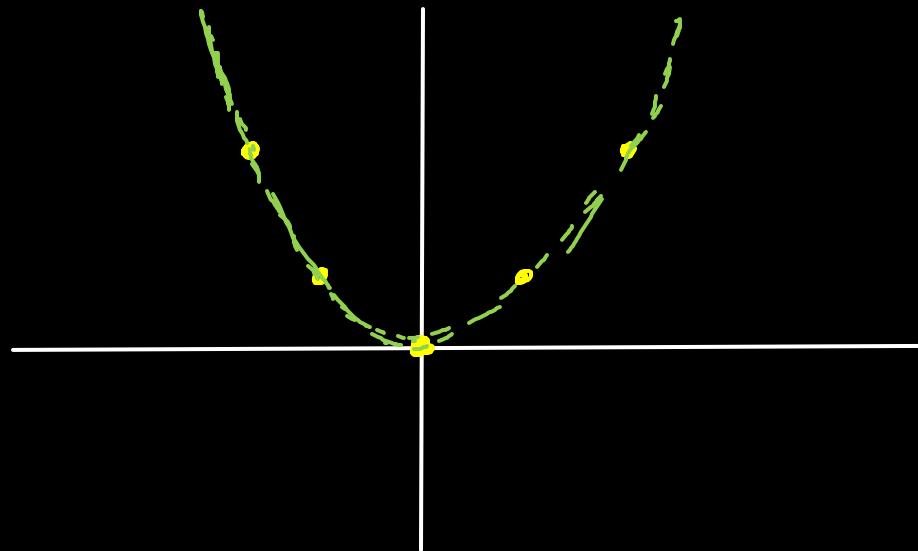
# Domain, Co-Domain & Range of Functions



# Graph of a function ✓

$$\begin{array}{c} \text{y} = f(x) \\ \longrightarrow \\ f(x) = x^2 \\ \longrightarrow \\ y = x^2 \end{array}$$

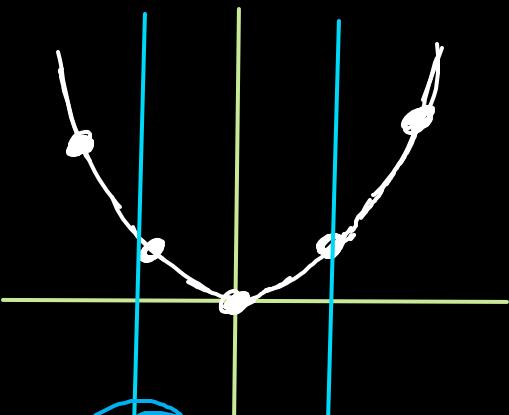
$$\begin{array}{ccccccc} x & : & 0 & 1 & -1 & -2 & 2 \\ y & : & 0 & 1 & 1 & 4 & 4 \end{array}$$



# Graph of a function

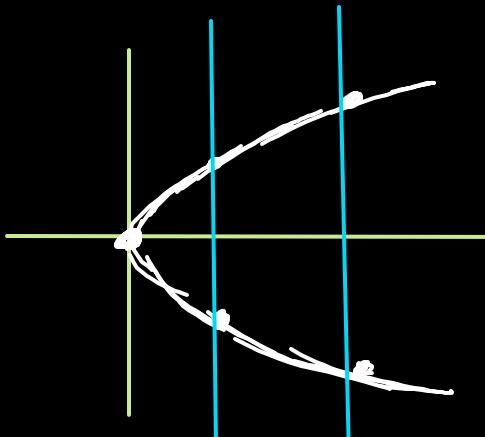
Which of the following is a functions

1)  $y = x^2$



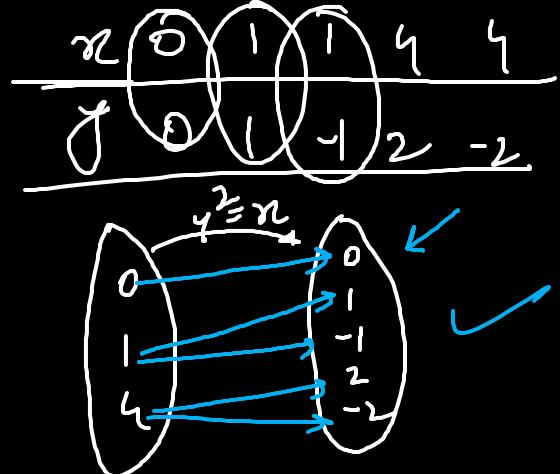
Yes

2)  $y^2 = x$

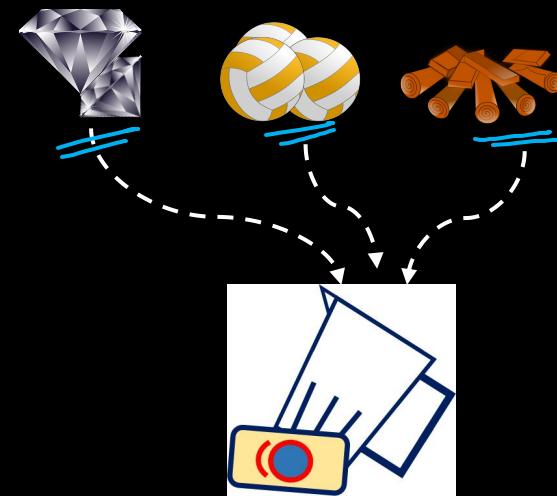
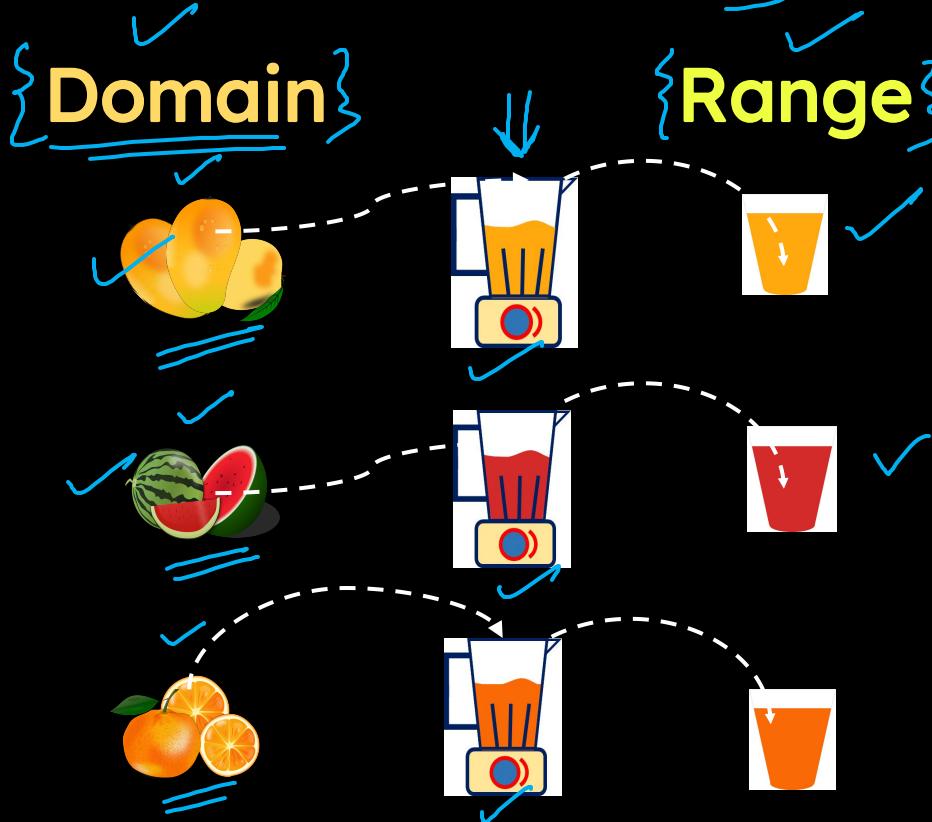


No

Vertical Line Test



# Functions as Machines



# Domain



# \*Domain

Rational Function

Example:

$$y = \frac{1}{x}$$

$$f(x) = \frac{1}{x}$$

Domain:  $\mathbb{R} - \{0\}$

Square Root Function

Example:

$$f(x) = \sqrt{x}$$

interval

Domain:  $[0, \infty)$

positive values & zero





## Example

Find the domain of following functions -  $f(x) = \frac{2x}{x^2 - 4}$

- A.  $x \in \mathbb{R} - \{-2, 2\}$
- B.  $x \in \mathbb{R} - [-2, 2]$
- C.  $x \in (2, \infty)$
- D.  $x \in (-\infty, -2] \cup [2, \infty)$

$$D \equiv \mathbb{R} - \{-2, 2\}$$



## Example

Find the domain of following functions -

$$f(x) = \frac{x^2 - 1}{(x - 1)x}$$

- A.  $\mathbb{R} - \{-1, 0, 1\}$
- C.  $\mathbb{R} - \{0, 1\}$
- B.  $\mathbb{R} - \{0\}$
- D.  $\mathbb{R} - \{-1, 0\}$

1

$f(x) = \frac{(x-1)(x+1)}{(x-1)x}$

$= \frac{x+1}{x}$

# Range



# Range

The set of values of  $y$  obtained by using all possible values of  $x$  as input.

## Method - 'x' in terms of 'y'

For the function  $y = f(x)$

Write  $x$  in terms of  $y$ .  
 $x = g(y)$

Now find the domain of 'g'.

Domain of 'g' is same as Range of 'f'.

$$y = f(u)$$

$$u = \boxed{g(y)}$$



## Example

Find the range of the following functions:

$$y = f(x) = \sqrt{\frac{2-x}{x}}$$

A.  $\mathbb{R}$   
=

B.  $\mathbb{R}^+$

C.  $[0, \infty)$   
*interval*

D.  $[0, 2]$

$$y = \sqrt{\frac{2-x}{x}}$$

$$y^2 = \frac{2-x}{x}$$

$$y^2 = \frac{2}{x} - 1$$

$$(1+y^2) = \frac{2}{x}$$

$$x = \frac{2}{1+y^2}$$

$$y \in \mathbb{R}$$

$y = \text{sqrt something}$   
 $y \geq 0$  — 2

$$\boxed{\sqrt{4} = 2}$$

$$\quad ; \quad \sqrt{4} = \pm 2$$

{ Sq. Root ans- is always +ve }

$$\boxed{n^2 = 4}$$

$$n = \pm \sqrt{4} \rightarrow \pm 2$$

# MON - WED

11<sup>th</sup>



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7 PM

Namo Sir  
Physics



12<sup>th</sup>



jee **LIVE** quiz 2.0

4 PM

Nishant Sir  
Maths



8 PM

Paaras Sir  
Chemistry



5 PM

Anupam Sir  
Chemistry



9 PM

Sameer Sir  
Maths



6 PM

Jayant Sir  
Physics



# THURS - SAT

12<sup>th</sup> 

7 PM Jayant Sir Physics



11<sup>th</sup> 

4 PM Sameer Sir Maths



8 PM Anupam Sir Chemistry



5 PM Paaras Sir Chemistry



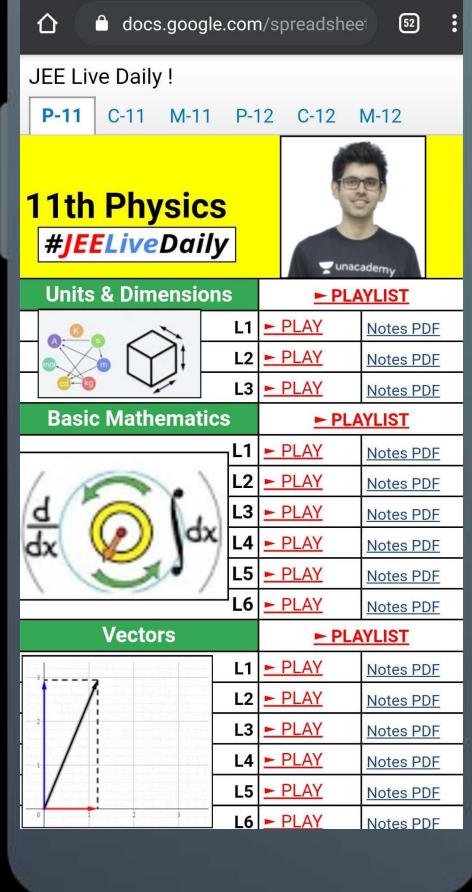
9 PM Nishant Sir Maths



6 PM Namo Sir Physics



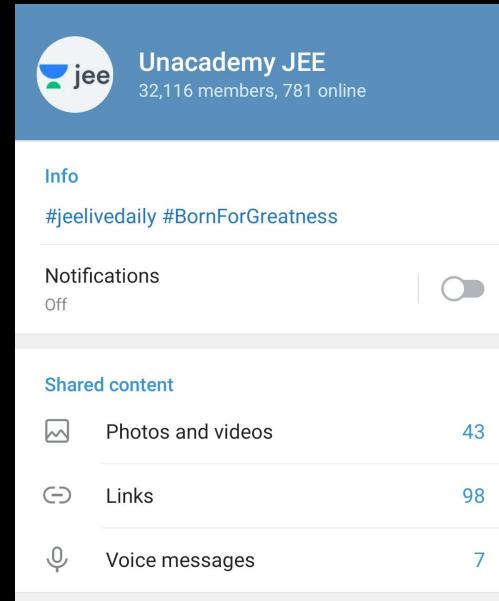
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# Telegram APP

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The screenshot shows the Telegram group info page for "Unacademy JEE". The header features the "jee" logo and the group name "Unacademy JEE" with 32,116 members and 781 online users. Below the header, there's an "Info" section with the hashtags "#jeeilivedaily #BornForGreatness". Under "Notifications", the switch is turned off. The "Shared content" section displays three categories with counts: Photos and videos (43), Links (98), and Voice messages (7). Each category has an associated icon: a photo camera for photos and videos, a link icon for links, and a microphone icon for voice messages.

Category	Count
Photos and videos	43
Links	98
Voice messages	7

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A screenshot of a Unacademy live session. At the top right is a video feed of a male educator named Rohit Sachan. To his left is a sidebar showing user activity: 'Srinchan Dutta Chaudhuri nitration' (right), 'Rohit Sachan Sir Baa rha mera' (left), 'Sinchan Dutta Chaudhuri right' (right), 'Shoaib Alam Left' (left), 'Vsvsgsg Right' (right), and 'Prashant Singh joined' (right). Below the video is a text message from Rohit Sachan: 'Sir please solve the one more doubt...'. A chemical reaction question is displayed: 'Q. In the following reaction, O=[N+]([O-])2 reacts with [FeCl4]-. X, the structure of the major product X is -'. Three chemical structures are shown: 1) O=[N+]([O-])2 (nitronium ion), 2) O=[N+]([O-])2 + [FeCl4]- -> X (reaction intermediate), and 3) O=[N+]([O-])2 + [FeCl4]- -> Y (reaction product). Handwritten annotations show arrows from the nitronium ion attacking the iron complex and electrons moving to form a new bond. Below the reaction is a note: 'e⁻ deficient' with an arrow pointing to the nitronium ion. Further down, handwritten text says ' $E^+$  attacks on e⁻ rich system'.

A screenshot of a Unacademy test results page. At the top, it says 'View solutions' and 'Share your results'. Below that, tabs for 'Overview', 'Physics', 'Chemistry', and 'Mathematics' are shown, with 'Physics' selected. The 'Physics' section shows a progress bar with a green segment and a red segment, with the text 'Score 88/120' and 'Accuracy 73%'. At the bottom of the page, there is a section titled 'NEGATIVE MARKING' and 'YOU MISSED 0'.



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D C Pandey

Question  
ROHIT SACHAN:  
Sir please solve the one more doubt...  
16. In the following case,  $\text{NO}_2^+$  attacks on  $\text{e}^-$  rich system.

$\text{NO}_2^+$  → attacks on  $\text{e}^-$  rich system

$\text{HNO}_3 / \text{H}_2\text{SO}_4$

$\text{O}^{\cdot-}$   $\text{O}^{\cdot-}$

$\text{e}^-$  deficiency

Sir B ac mera

Sirchand Dutta Chaudhuri right

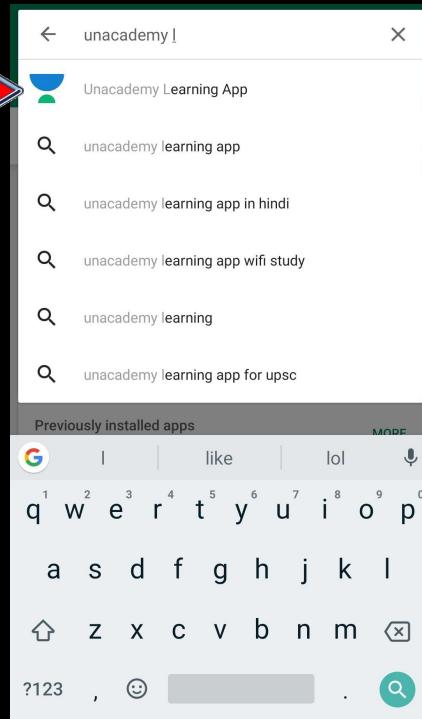
Shoaib Alam Left

Vsvsgsg Right

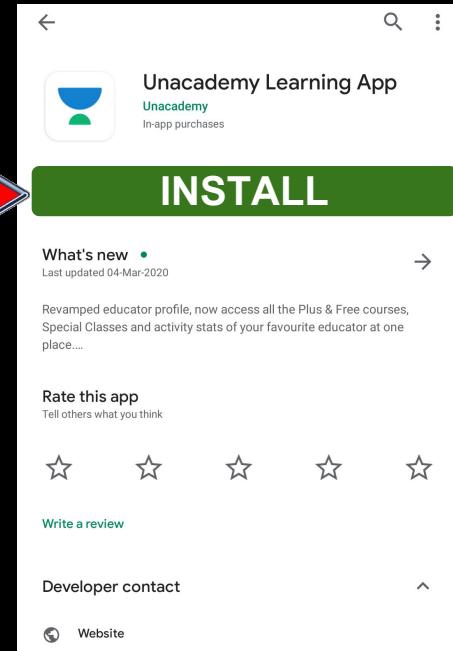
P Prashant Singh joined

Rohit Sachan Left

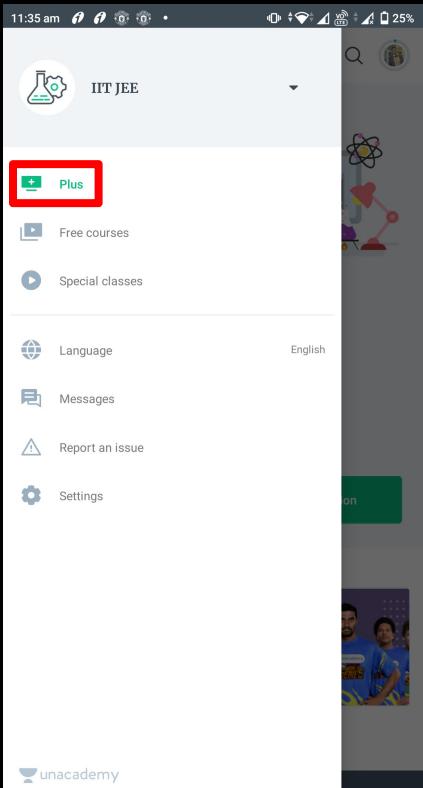
# Step 1



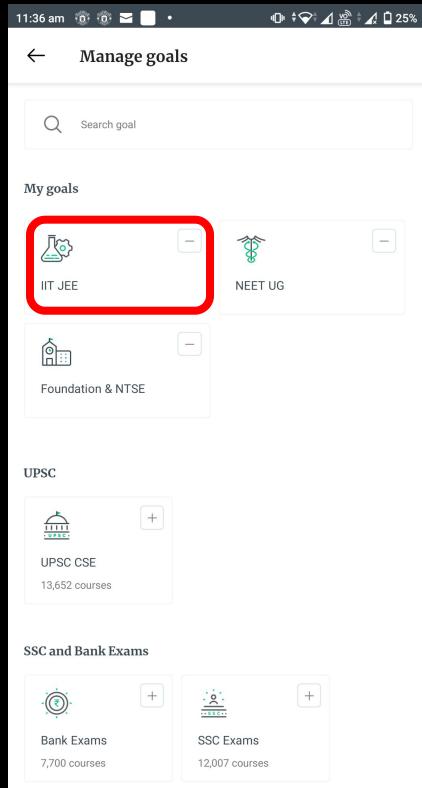
# Step 2



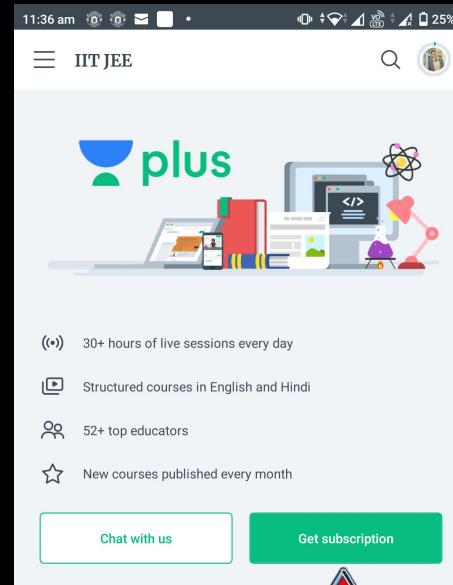
# Step 3



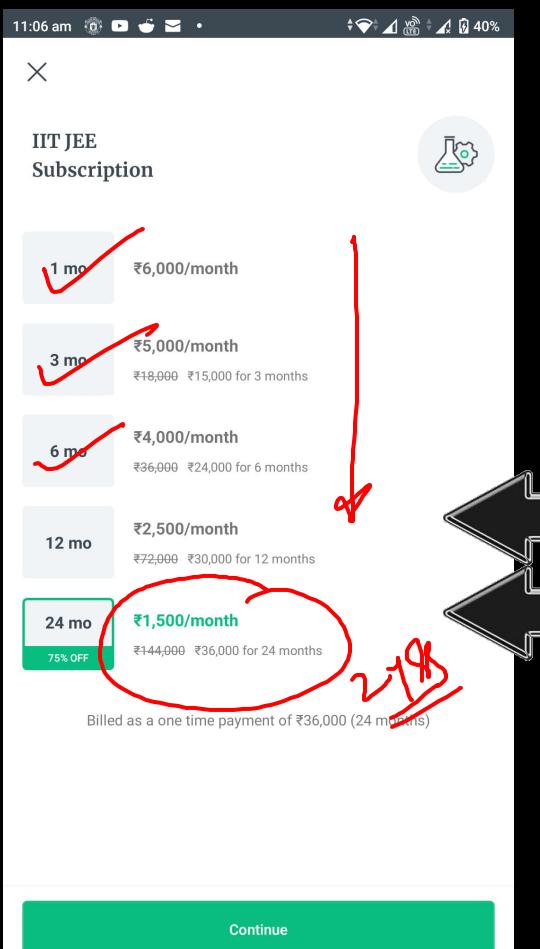
# Step 4



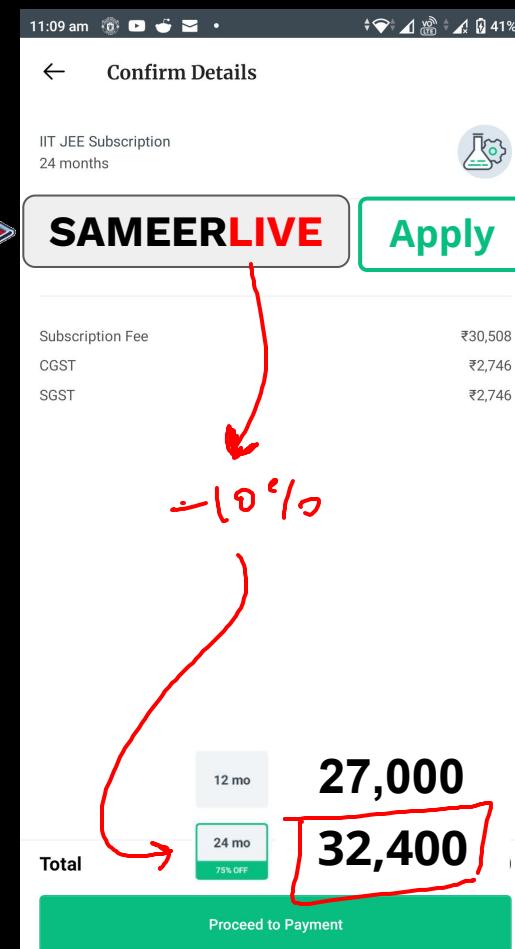
# Step 5



# Step 6

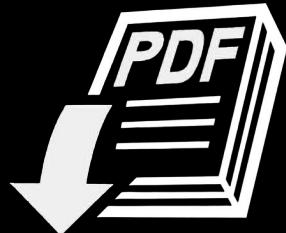


# Step 7





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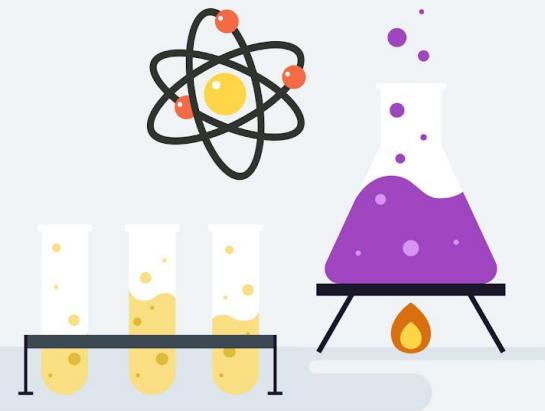
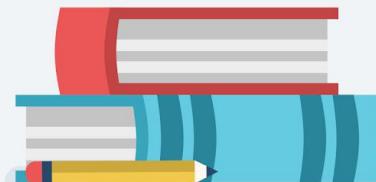
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