॥ श्री ॥

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Chapter → 6 → Set, Function & Relation

Set :→ { }

- Group of elements (किसी का भी हो सकता है)

A = 5, 7, 8 ⟹ A is no. of group

A = {5, 7, 8} ⟹ A is set of groups

[opening & closing curly Brackets]

(किसी भी set में कितने no. है) → Cardinal number → n(A) = 4

A = {3, 4, 5, 8}

B = {7, 8, 5}

n(B) = 3 no. of element in the Set B

Base on Cardinal no.

Types of Set

(जिस set में एक ही no. है) → Singleton set

A = {7}

B = {5}

(जो set खाली है) → Null set / empty set / void set

∅ or { }

Phi

Set → Baap Subset → Bacha

Er set अपने आप का Improper subset होगा है

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(किसी भी set का छोटा part)

Subset :→

$A = \{2, 3, 5\}$

$B = \{3, 5\}$

B is said to be subset of set A when all the elements of set B belong to set A.

BCA

- no. of subset → 2^n

$2^3 = 8$

$\{2\}, \{3\}, \{5\}$
$\{2,3\}, \{3,5\}, \{5,2\}$
$\{2,3,5\}, \{\}$

Improper Subset

& 1

[the subset which is equal to the main set]

Proper Subset

$2^n - 1$

[the subset which is smaller than main set]

A or B = A ∪ B

A But not B = 'A ∩ B'

Hockey ✓
Cricket ✓
H & C ✓
Nothing → Nothing

} atleast

U → OR
Atleast
Not A → A'
∩ → And
Both
But

Total = atleast + Nothing

U stands for Union → if it Between two sets.

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* Universal set :→ [U = E = S]

• whatever nos we required is present in universal set.

e.g → U = E = S = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}

* Compliment of set :→ C or A'

• Is a set which contains all the elements of universe expect those of set A.

~~Set~~ A = {2, 3, 7, 9}

A' = A^C = {1, 4, 5, 6, 8, 10}

A' stands for A का compliment

* Operation on set :→

U → ~~&~~ or (atleast)

(i) Union :→ AUB

• If it comes between two set

Union में no. हो या तो A का या तो B का या तो Both..

to take union means Just combine the elements all should written once repitition not allowed

e.g → A {2, 3, 7, 8, 9}
B {1, 5, 7, 9, 10}

AUB = {2, 3, 7, 8, 9, 1, 5, 10}

(ii) Inter :→ A∩B

∩ → And, BOTH, BUT

• We take common

means to take common

e.g = A∩B = {7, 9}

ये भी करना पड़ेगा वो B.W.
foundation का B.com

remove same no. of set B from set A

(iii) Substraction :- A-B

eg ⇒ A-B = { 2, 3, 8 }
B-A = { 1, 5, 10 }

Master Question

(Universe) U = { 1, 2, 3, 4, 5, 6, 7, 8 }

Set A = { 2, 5, 6, 7 }

Set B = { 1, 3, 5, 7 }

Set C = { 1, 5, 8, 4, 2 }

Find (i) A' = { 1, 3, 4, 8 }

(ii) A ∪ B = { 2, 5, 6, 7, 1, 3 }

B' { 2, 4, 6, 8 } (iii) A ∩ B' = { 2, 6 }

(iv) A-B = { 2, 3, 6 }

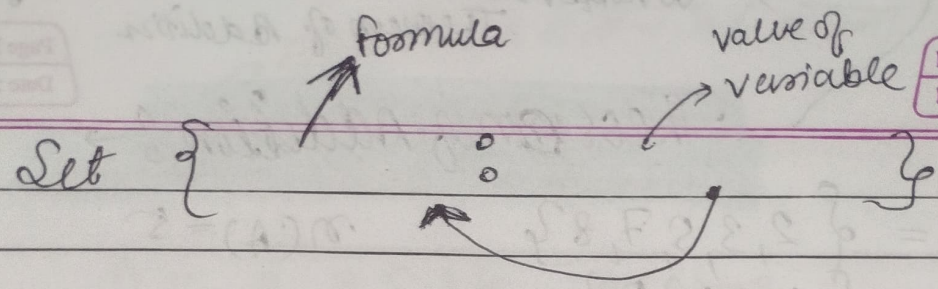
C' { 8, 3, 6, 7 } (v) C' ∪ A = { 2, 5, 6, 7, 3 }

(vi) B-C = { 3, 7 }

4 SUBJECTIVE

X

Q is even & not odd



: or | → indicate → Set is divided into to part

left Part → indicate → formula

Right Part → indicate → value of variable

Number Series :-

① natural no. = 1, 2, 3 . . . . . ∞ (Perfect no)

② whole no. = 0, 1, 2, 3 . . . . . ∞

③ Integer = −3, −2, −1, 0, 1, 2, 3 . . . ∞ (Perfect no)

④ Rational no. = 1, 3, −1, −5, 0, $\frac{7}{8}$, 0.35 . . . .

[Perfect no ✓, Imperfect no. ✓, + ✓, − ✓, fraction ✓, decimal ✓]

⑤ Irrational no. = $\sqrt{3}$, $\sqrt{5}$, $\sqrt{7}$, $\sqrt{8}$
[square root of non perfect square]

⑥ Real no. = rational & Irrational no.

⑦ Even no. ⇒ 0, 2, 4, 6 . . . ∞

⑧ Odd no. = 1, 3, 5 . . ∞

0 is even & not odd
0 is neither + nor −

Wherever there is union always apply Theorem of Addition

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Theorem of Addition :→

$A = \{2, 3, 5, 7, 8\}$ $\quad n(A) = 5$

$B = \{1, 3, 4, 5\}$ $\quad n(B) = 4$

$A \cup B = \{1, 2, 3, 4, 5, 7, 8\}$

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

$7 = 5 + 4 - 2$

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

* $n(A \cap B') = n(A) - n(A \cap B)$

* $n(A' \cap B) = n(B) - n(A \cap B)$

मतलब A & B के बिच Jodi बनाना

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Multiplication set :→

$A = \{3, 5, 8\}$ $\quad n(A) = 3$

$B = \{7, 9\}$ $\quad n(B) = 2$

$A \times B = \{(3,7), (3,9), (5,7), (5,9), (8,7), (8,9)\}$

$B \times A = \{(7,3), (7,5), (7,8), (9,3), (9,5), (9,8)\}$

$n(A \times B) = 3 \times 2 = 16.$

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Function :→

Concept 1 ● $A = \{7, 5, 2\}$ $B = \{3, 8\}$

$A \times B = \{(7,3)\ (7,8)\ (5,3)\ (5,8)\ (2,3)\ (2,8)\}$

Input Output

Concept 2 ● eg1 $\{(3,8)\ (5,2)\ (7,5)\ (6,1)\}$

domain = input = $\{3, 5, 7, 6\}$

['domain means set of all inputs']

Codomain / range = output = $\{8, 2, 5, 11\}$

['set of all output']

eg2 $\{(7,8)\ (5,2)\}$

domain = $\{7, 5\}$

Co-domain / range = $\{8, 2\}$

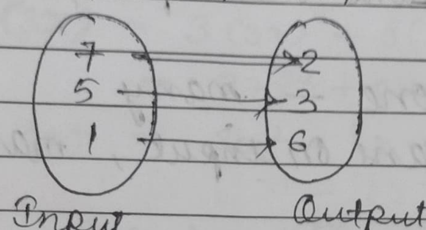
- Their exist some relation between input & output Sometimes this relation is called as function (not always)

Input | Output
Students | marks
Student का na एक ही होना चाहिए
marks to same हो सकते हैं

[Output 1 चाहिए Input कितने भी हों]

A relation is said to be function, if for any input there is only one output.

e.g. ① {(7,2) (5,3) (1,6)}

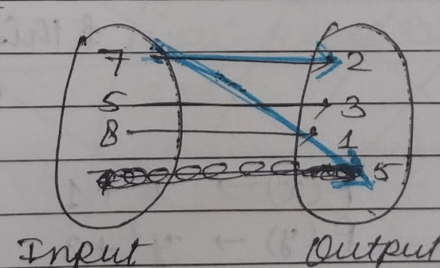


[One-one]

7 has only one output that is 2
5 has only one output that is 3
1 has only one output that is 6

∴ So, it is a function.

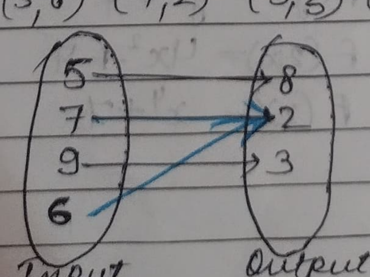
e.g. ② {(7,2) (5,3) (8,1) (7,5)}



[One-many]

∴ So, it is not an function [7 → 2, 5]

e.g. ③ {(5,8) (7,2) (9,3) (6,2)}



[many-one]

∴ So, it is a function (7, 6 → 2)

Relation Type :→

① One — One
means one input, one output →

Not function ← ② one — many
means on input, many output. ✗

③ many-one
means many input, on output →

function :→

$f(x)$ → f of x
f → is name of the function
& this is functions of x or formula of x

$f(x) \rightarrow x^2+1$
$f(y) \rightarrow y^2+3$

① • $f(x) = x^2+7$
& $f(3) = 16$
$f(5) = 32$
$f(y) = y^2+7$
$f(2x) = 4x^2+7$
$f(x)^2 = x^4+7$

$(3x)^2$
$3 \cdot 3x^2$

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(2) $f(x) = 3x^2 + 8x - 7$

Find (a) $f(5) \Rightarrow 3(5)^2 + 8(5) - 7 = 108$

(b) $f(3x) + 2f(x) - 12$

$f(3x) = 3(3x)^2 + 8(3x) - 7$

$= 27x^2 + 24x - 7$

$f(x) = 3x^2 + 8x - 7$

$f(3x) + 2f(x) - 12$

$27x^2 + 24x - 7 + 2(3x^2 + 8x - 7) - 12$

$27x^2 + 24x - 7 + 6x^2 + 16x - 14 - 12$

$33x^2 + 40x - 33$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\frac{-40 \pm \sqrt{(40)^2 - 4 \times 33 \times (-33)}}{2 \times 33}$$

$$-40 \pm \sqrt{1600}$$

Composite function :-

The function which combines two other function

$f(x) \longrightarrow f$ of x (or $f(x)$)

$g(x) \longrightarrow g$ of x

① $f(x) = x+8$

$g(x) = 3x$

Find $f \circ g\ (x)$ (f of g)

$g \circ f\ (x)$

$\Rightarrow f \circ g(x) = f[g(x)]$ $\quad f(x) = x+8$

$= f[3x]$

$= 3x+8$

$\Rightarrow g \circ f\ (x) = g[f(x)]$

$= g[x+8]$ $\quad g(x) = 3x$

$= 3(x+8)$

$= 3x+24$

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② $f(x) = x^2+7$
$g(x) = x+8$
And $fog(x)$
$gof(x)$

→ $fog(x) = f[g(x)]$
$= f[x+8]$
$= (x+8)^2+7$ $\quad f(x)=x^2+7$
$= x^2+64+16x+7$
$= x^2+16x+71$

⇒ $gof(x) = g[f(x)]$
$= g[x^2+7]$
$= (x^2+7)+8$ $\quad g(x)=x+8$
$= x^2+15$

③ $f(x) = 3x+8$
$g(x) = 7x-2$
Find $fog(x)$
$gof(x)$

→ $fog(x) = f[g(x)]$
$= f[7x-2]$
$= 3(7x-2)+8$ $\quad f(x)=3x+8$
$21x-6+8$
$21x+2$

→ $gof(x) = g[f(x)]$
$= g[3x+8]$
$= 7(3x+8)-2$ $\quad g(x)=7x-2$
$= 21x+56-2$
$= 21x+54$

(4) $f(x) = \frac{3x+1}{x}$

$g(x) = \frac{1}{x+1}$

Find $fog(x)$

$\rightarrow fog(x) \Longrightarrow f[g(x)]$

$= f\left[\frac{1}{x+1}\right]$

$= f \; \frac{3\left(\frac{1}{x+1}\right)+1}{\left(\frac{1}{x+1}\right)}$

$\frac{\frac{3}{x+1}+1}{\frac{1}{x+1}}$

$\frac{3+x+1}{x+1} \Big] \rightarrow 4+x$

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

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Inverse function :-

The function which acts the reverse way of original function called Inverse function

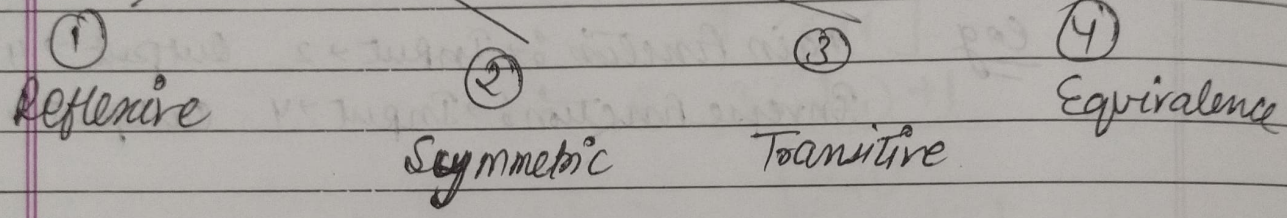
$$F(x) \longrightarrow F^{-1}(x)$$

function — Inverse function

Eg main function :- Input → 2 Output → 4
Inverse function :- Input → 4 Output → 2

Relation

Types of Relation



① Reflexive :→ ~~Input रखा A Out put भी A मिलेगा~~.
Input रखा A output भी A मिलेगा।

② Symmetric :→ Agar A के लिए B है तो B के लिए A होना चाहिए

③ Transitive :→ Agar A के लिए B है, B के लिए C है, तो A के लिए C होना चाहिए।

④ Equivalence :→

De-Morgan's Law

$$(A \cup B)' = A' \cap B'$$

$$(A \cap B)' = A' \cup B'$$