Function.

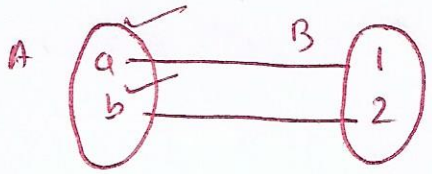
defn → A relation 'f' from a set 'A' to a set 'B' is called function of each element of A, we can assign unique element of 'B'.

↳ extra from relation.

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

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

*



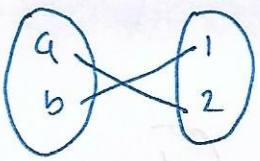
(mapping)

(function).

denoted by $(a,1)$ $(b,2)$

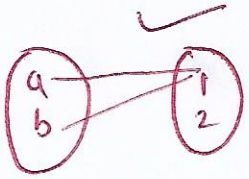
* unique element of 'B'

we can also do



$(a,2), (b,1)$

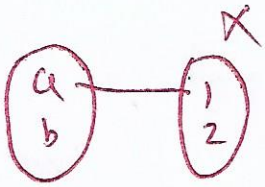
we can also tell that



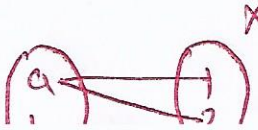
$a \longrightarrow 1$

$b \longrightarrow 1$

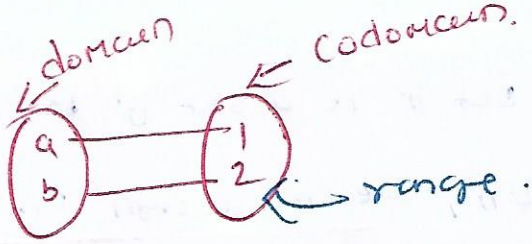
→ for 'a' '1' is unique.



we left 'b' so not function.



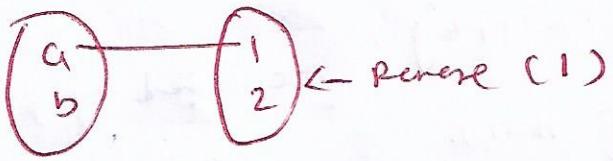
not unique.



→ Sometime asked the range of the function?

→ we considered it from right hand side. (i.e codomain)

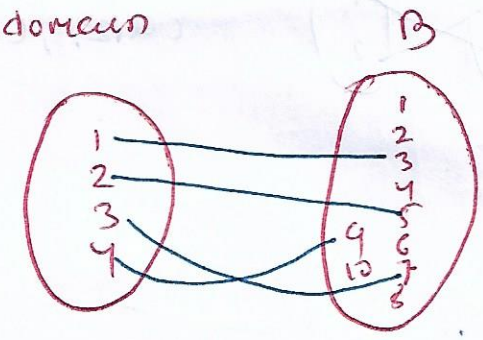
Here range (1,2) ← all pratiupcite elements.



Ex: $f(x) \to 2x+1$

Let A → domain.

B → codomain



Here the set of elements that got pointed to in 'B', are Range, and also called the image.

Domain: {1,2,3,4}

co domain: {1,2,3,4,5,6,7,8,9,10}

Range: {3,5,7,9}.

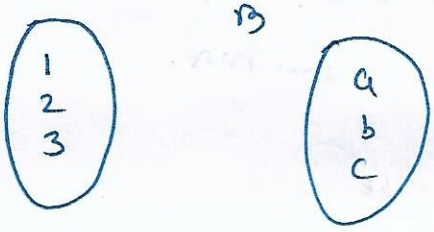
Types of Function.

- → One to one Function (injective)
- → Onto Function (surjective)
- → One to one Correspondence (bijective).

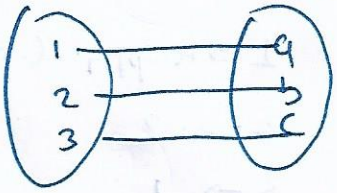
① one to one Function (injective).

defn → A function 'f' from set 'A' to 'B' is one to one if no two elements in 'A' are not mapped to same element in 'B'.

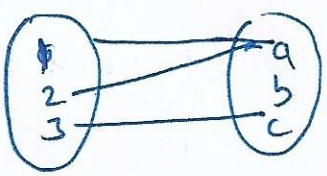
Exp



* For function we need the unique mapping from 'A' → 'B'.
But in one-to one Function, one more rule i.e 'A' is not mapped to same element in 'B'.



Function & also one to one

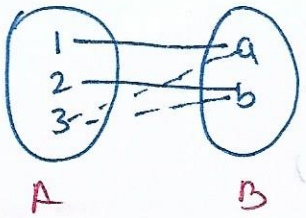


Function but not one to one

(1 → a, 2 → a) — not in one-to-one.

Theory — Cond^n for one-to-one function

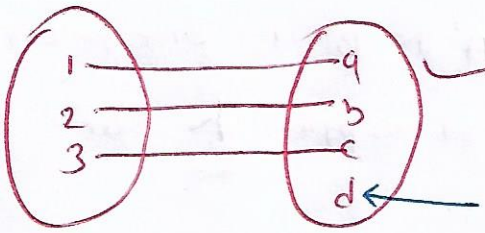
Exp



not possible.
for one-to-one function,

* If A = element (x)
B = elent (y)

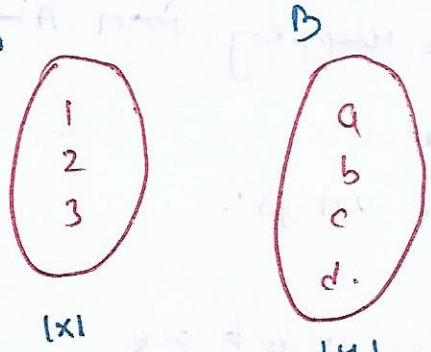
$y \geq x$ ← for one to one function.



one to one.

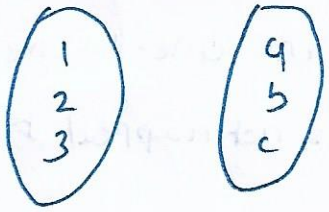
if it is vacent, still it is one to one function.

How many one to one function possible



1 → mapping (4 option/choice)
2 → 3 choice.
3 → 2 choice.

$(4 \times 3 \times 2)$ ← total.



1 → mapping (3 choices)
2 → 2
3 → 1

$3 \times 2 \times 1 \rightarrow 6$ (total)

→ For many it generalized,
If A set has elemt |x|, B set has elemt |y|

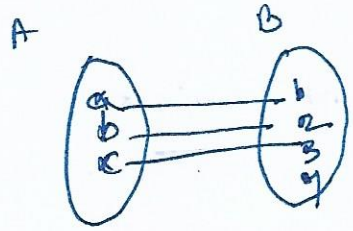
$1 \rightarrow |y|$ $\{ y(y-1)(y-2) \cdots y-(x-1) \}$

part-5

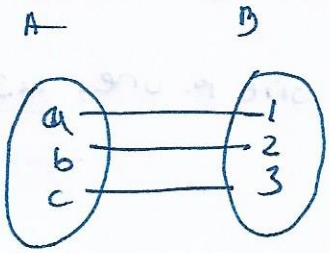
(b) onto function.

Diff → A function 'f' from set 'A' to set 'B' is onto function if each element of 'B' is mapped to atleast one element of 'A'.

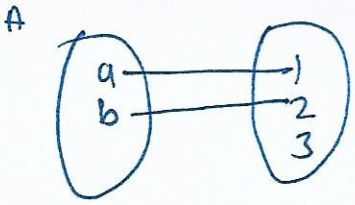
→ Range of f = B



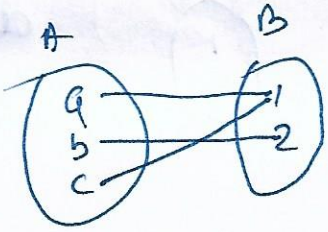
(not onto) ✗



(onto) ✓



(not onto)



(onto) ✓

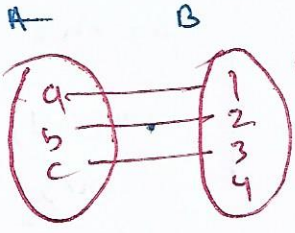
$|A| \geq |B|$ ✓

↳ Condition satisfied for onto function.

(Q) If a function is one-to-one then onto ? (✗)

Ans - no

Eg



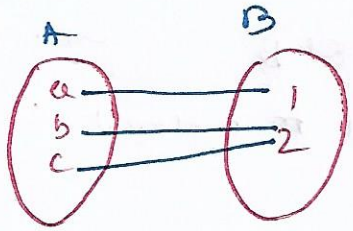
→ It is one to one because each element of set 'A' used.

→ But not onto, because 4 is not related with 'A'

part B

(Q3) All onto function is one-to one? (X)

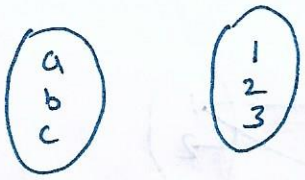
Exp



→ It is ~~one-to~~ onto function.
as there is no element left at 'B'.

→ but not one to one, as $\left.\begin{matrix} b-2 \\ c-2 \end{matrix}\right\}$ not unique

(Q4) How many onto function possible of |A|=|B|.



$a \longrightarrow n$
$b \longrightarrow n-1$
$c \longrightarrow n-2$

So $\Rightarrow$ $n!$

Some common Question on Relation & Function.

(Q5) How Many Function can possible?

$A = \{1,2,3,4\}$, $B = \{a,b,c\}$.
|X| |Y|

Ex

Max^n relation. → $A \times B \rightarrow x \cdot y$

↳ 2^{xy}

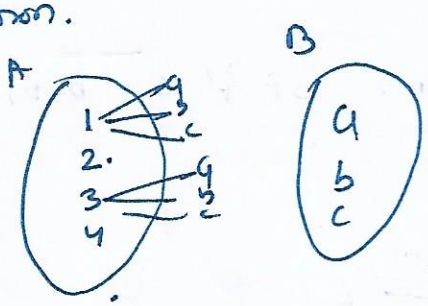
For this example.

$|x| = 4$, $|y| = 3$

$2^{4\times3} = 2^{12}$

ans-3)

For function.



1 → 3
2 → 3
3 → 3
4 → 3
} possibility

So Total no of max function.

→ $3 \times 3 \times 3 \times 3 \Rightarrow \underline{3^4}$

let. no of element in Set A = |X|

no of element in Set B = |Y|

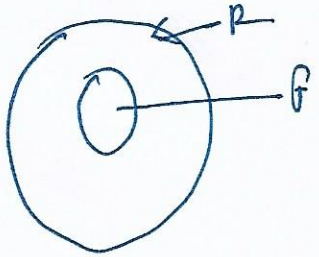
max function → $\underline{y^x}$

(a5) How may relation which are not function?

In the above example we can take

max relation
max function
} possible.

So relation that are not function => $\boxed{2^{xy} - y^x}$



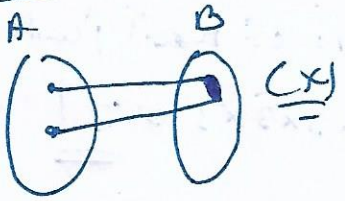
$\Rightarrow 2^{12} - 3^4 = 4096 - 81$

$= \underline{4015}$

⑥ Bijection Function

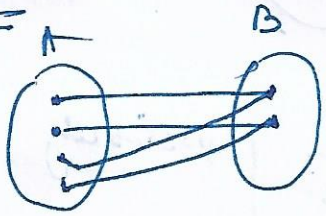
A function $A \to B$ is called bijection if f is both one-to-one & onto function.

one to one.



$|B| \geq |A|$

onto



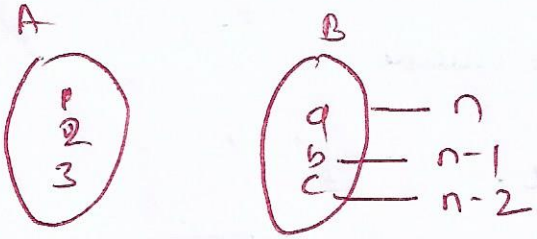
but here.

$|A \geq |B|$

* ~~If~~ ~~one~~ combine both cond^n

$A = B$ for bijection function.

* Total no of bijection func^n.



So that.

Total no of bijection function possible

$\Rightarrow (n)(n-1)(n-2) = n!$