Relation And Function

* **Set** :- A Set is a collection of well defined objects.
  Ex:- $A = \{1, 2, 3, 4\}$

* **Cartesian Product** :-
  Ex:- $A = \{1, 2, 3, 4\}$
  $B = \{5, 6\}$

$A \times B = \{(1,5)(1,6)(2,5)(2,6)(3,5)(3,6)(4,5)(4,6)\}$.
$B \times A = \{(5,1)(5,2)(5,3)(5,4)(6,1)(6,2)(6,3)(6,4)\}$.

$\therefore A \times B \neq B \times A$

here $(1,5) \neq (5,1)$

* **Domain** :- Domain is the first element in the ordered paired of Cartesian Product.

Ex:- Taking previous example.

$A \times B = \{(1,5)(1,6),(2,5)(2,6)(3,5)(3,6)(4,5)(4,6)\}$.

So here Domain is $\{1, 2, 3, 4\}$.

Taking another Cartesian Product

$B \times A = \{(5,1),(5,2),(5,3)(5,4),(6,1)(6,2)(6,3)(6,4)\}$.

So here Domain is $\{5, 6\}$.

Range :- Range is the second element in the ordered pair of Cartesian Product.

Ex:- Taking same example,

$A \times B = \{(1,5),(1,6),(2,5)(2,6)(3,5)(3,6)(4,5)(4,6)\}$.

So here Range is ~~$\{5,6\}$~~ $\{5, 6\}$

* **Relation** :- Relation is a subset of a Cartesian Product.

example :- Let $A = \{a, b, c, d\}$

$B = \{1, 2\}$

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

$R = \{(x, y) : x \text{ is a consonant and } y \text{ is a odd no}\}$

$\therefore R = \{(b,1), (c,1)(d,1)\}$.

* **Function** :- Function is a special type of relation. In which domain (Pre-image) should not repeated.

Ex:- (i) $R = \{(1,2), (5,6), (7,9)\}$.

This is a function, because here pre image is not repeating.

(ii) $R = \{(1,2), (1,6), (2,5)\}$

This Relation is not a function because here '1' is repeating.

:6 Every function is a relation, but every relation is not necessary to be function".