

ALGEBRA

Relation and Function

* Ordered Pair :

1) If $(a,b) = (c,d)$ then there must be $a = c$ and $b = d$

* Cartesian Product :

2) If $A = \{a,b,c\}$ and $B = \{x,y\}$ then,

$$A \times B = \{(a,x), (a,y), (b,x), (b,y), (c,x), (c,y)\}$$

3) If $A \times B = \phi$ then it will be either $A = \phi$ or $B = \phi$

4) If $A \times B = B \times A$ then there must be $A = B$

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

Where $n(A)$ = number of elements in set A

$n(B)$ = number of elements in set B

$n(A \times B)$ = number of pairs in set $A \times B$

* Relation :

If an ordered pair $R = \{(a,a), (a,b), (b,c), (b,d)\}$ then, It's

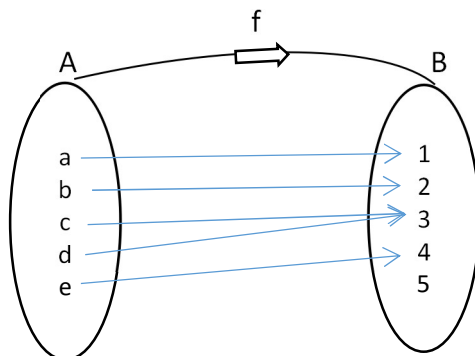
6) Domain $(D) = \{a, b\}$ // Or $D = \{ \text{Uniquely first elements of all pairs of } R \}$

7) Range $(R) = \{a,b,c,d\}$ // Or $R = \{ \text{Uniquely last elements of all pairs of } R \}$

8) Inverse of Relation $(R^{-1}) = \{(a,a), (b,a), (c,b), (d,b)\}$

* Function :

In a function f , where $f:A \rightarrow B$ or $f(A) = B$ i.e



Then,

9) Domain of f , $(D) = \text{Elements in set } A$
 $= \{a,b,c,d,e\}$

- 10) Co-domain of f , $(C) = \text{Elements in set B}$
 $= \{ 1,2,3,4,5 \}$
- 11) Range of f , $(R) = \text{Elements in set B that have pair in set A}$
 $= \{ 1,2,3,4 \}$
- 12) Image of f , $(I) = \text{Elements in set B that have pre-image in set A}$
 $= \{ 1,2,3,4 \}$
- 13) Pre-image of f , $(P) = \text{Elements in set A that have image in set B}$
 $= \{ a,b,c,d,e \}$

For Example :

If $f(x) = 3x-5$ having image 7 then, find pre-image,range,domain .

Ans :=>

Equate $f(x) = 7$ Then,
you got the value of x .

- I. i.e is your pre-image of 7
- II. Range = Image
- III. Domain = Pre-image

Basically,

- 14) Range is the subset of Co-domain i.e $R \subseteq C$
- 15) Image = Range i.e $I = R$
- 16) Pre-image = Domain i.e $P = D$

Polynomial

- 17) Linear Function :

$$y = f(x) = mx+c$$

- 18) Quadratic Function :

$$y = f(x) = ax^2+bx+c$$

- 19) Degree of polynomial, $D = \text{highest power of variables}$

i.e if $f(x) = x^3 + x^2y^2 + x + 1$ then it's degree,

$$\begin{aligned} D &= 2+2 \\ &= 4 \end{aligned}$$

Sequence and Series

Arithmetic Sequence :

If the first order differences are equal then,

Some Notations :

a) First term = a or t_1

b) Last term = l or t_n

c) Common difference = d

d) Sum = S or Σ

20) Common difference (d) = $t_2 - t_1 = t_3 - t_2 = \dots = t_n - t_{n-1}$

21) Second term (t_2) = $a + d$

22) Third term (t_3) = $a + 2d = t_2 + d$

23) General term (t_n) = $a + (n-1)d$

24) Sum (S) = $t_1 + t_2 + t_3 + \dots + t_n$

25) Sum of natural numbers up to n terms,

$$S = n(n+1)/2$$

26) Sum of even numbers up to n terms,

$$S = n(n+1)$$

27) Sum of odd numbers up to n terms,

$$S = n^2$$

If the second order differences are equal then,

28) General term (t_n) = $an^2 + bn + c$

29) First term (t_1) = $a + b + c$

30) First term of first difference (F_1F_d) = $3a + b$

31) Second Order Difference (S_d) = $2a$

Geometric Sequence :

32) Common ratio (r) = $t_2/t_1 = t_3/t_2 = \dots = t_n/t_{n-1}$

33) Second term (t_2) = ar

34) Third term (t_3) = $ar^2 = t_2 \cdot r$

35) General term (t_n) = $ar^{(n-1)}$

Where a is the first term.

Thank You !!!