

NCERT DISCRETE 11.9.2.15

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Question:if $\frac{a^n+b^n}{a^{n-1}+b^{n-1}}$ is A.M between a and b , then find value of n .

Solution:

Numbers a , A.M(of a, b) and b can be represented as continuous terms of an A.P given by $x(m)$.

A.M of a, b equals average those two numbers. So Let,

$$x(0) = a \quad (1)$$

$$x(1) = A.M \quad (2)$$

$$x(2) = b \quad (3)$$

$$\text{Now common difference is } \frac{b-a}{2} \quad (4)$$

$$\Rightarrow x(m) = a + m \cdot \frac{b-a}{2} \quad (5)$$

$$\frac{x(0)^n + x(2)^n}{x(0)^{n-1} + x(2)^{n-1}} = \frac{x(0) + x(2)}{2} \quad (6)$$

$$2(x(0)^n + x(2)^n) = x(0)^n + x(2)^n + x(2) \cdot x(0)^{n-1} + x(0) \cdot x(2)^{n-1} \quad (7)$$

$$x(0)^n + x(2)^n = x(2) \cdot x(0)^{n-1} + x(0) \cdot x(2)^{n-1} \quad (8)$$

$$x(0)^{n-1} \cdot (x(0) - x(2)) = x(2)^{n-1} (x(0) - x(2)) \quad (9)$$

For $x(0) \neq x(2)$

$$x(0)^{n-1} = x(2)^{n-1}$$

$$\Rightarrow n=1.$$

For $x(0) = x(2)$

$$\Rightarrow n \in \mathbb{R} \text{ i.e } n \text{ is a real value.}$$

S/No	Symbol	Values	Description
1	$x(0)$	a	First term of A.P
2	$x(1)$	$\frac{a+b}{2}$	A.M of first and third terms of A.P
3	$x(2)$	b	Third term of A.P

TABLE I
PARAMETERS