

AI1110

Assignment 1

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1 ICSE 2018 GRADE 10

QUESTION 11(A)

The 4th term of an A.P. is 22 and 15th term is 66. Find the first term and the common difference. Hence find the sum of series upto 8th term.

2 SOLUTION

Symbol	Value
m	4
n	15
a_m	22
a_n	66

Let m^{th} and n^{th} term of an A.P be a_m and a_n respectively

Let first term of A.P. be a

Let common difference of A.P. be d

The x^{th} (a_x) term of any Arithmetic progression is given by

$$a_x = a + (x - 1)d$$

So,

$$a_m = a + (m - 1)d \quad (2.0.1)$$

$$a_n = a + (n - 1)d \quad (2.0.2)$$

Subtracting (2.0.1) and (2.0.2) we get,

$$(m - n)d = a_m - a_n \quad (2.0.3)$$

$$d = \frac{a_m - a_n}{m - n} \quad (2.0.4)$$

Putting the value of d in (2.0.1) equation

$$a + (m - 1) \left(\frac{a_m - a_n}{m - n} \right) = a_m \quad (2.0.5)$$

$$a = a_m - (m - 1) \left(\frac{a_m - a_n}{m - n} \right) \quad (2.0.6)$$

Given the 4th term of the A.P is 22

15th term of A.P. is 66

Putting the values of m , n , a_m and a_n from the table in (2.0.4) and (2.0.6)

We get 1st term of the A.P. is 10 and common difference is 4.

Sum of an A.P till x terms is given by

$$S_x = \left(\frac{x}{2} \right) (2a + (x - 1)d) \quad (2.0.7)$$

Putting the values of a and d from (2.0.4) and (2.0.6), we get

$$S_x = \left(\frac{x}{2} \right) \left(2 \left(a_m - (m - 1) \left(\frac{a_m - a_n}{m - n} \right) \right) \right) \quad (2.0.8)$$

$$+ \left(\frac{x}{2} \right) \left((x - 1) \left(\frac{a_m - a_n}{m - n} \right) \right)$$

$$S_x = \left(\frac{x(a_m(m - n) - (m - 1)(a_m - a_n))}{m - n} \right) \quad (2.0.9)$$

$$+ \left(\frac{x(x - 1)(a_m - a_n)}{2(m - n)} \right)$$

So, putting the values of

m , n , a_m and a_n from the table and $x = 8$ in (2.0.9) we get sum of A.P till 8th term is

$$S_8 = \left(\frac{(8)(22(-11) - (3)(-44))}{-11} \right) \quad (2.0.10)$$

$$+ \left(\frac{8(7)(-44)}{2(-11)} \right)$$

$$S_8 = 80 + 112 \quad (2.0.11)$$

$$S_8 = 192 \quad (2.0.12)$$