AI1110
Assignment 1

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1 ICSE 2018 Grade 10 Question 11(a)

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

2 Solution

Let mth and nth 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 xth (a_x) term of any Arithmetic progression is given by
$a_x = a + (x-1)d$
So,

$$a_m = a + (m-1)d \tag{2.0.1}$$
$$a_n = a + (n-1)d \tag{2.0.2}$$

Subtracting (2.0.1) and (2.0.2) we get,

$$(m-n)d = a_m - a_n \tag{2.0.3}$$
$$d = \frac{a_m - a_n}{m-n} \tag{2.0.4}$$

Putting the value of d in (2.0.1) equation

$$a + (m-1)\left(\frac{a_m - a_n}{m-n}\right) = a_m \tag{2.0.5}$$
$$a = a_m - (m-1)\left(\frac{a_m - a_n}{m-n}\right) \tag{2.0.6}$$

Given the 4^{th}term of the A.P is 22
15^{th} term of A.P. is 66
Putting the values of
$m = 4$
$n = 15$
$a_m = 22$
$a_n = 66$
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

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

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

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

So, putting the values of
$m = 4$
$n = 15$
$a_m = 22$
$a_n = 66$
$x = 8$
So, sum of A.P till 8^{th} term is

$$S_8 = \left(\frac{8}{2}\right)(2(10) + (8-1)4 \tag{2.0.8}$$
$$S_8 = 4(20+28) \tag{2.0.9}$$
$$S_8 = 192 \tag{2.0.10}$$