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NCERT Class 11 Mathematics Solutions: Chapter 9 – Sequences and Series Miscellaneous Exercise 9 Part 1

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Arithmetic Series

An arithmetic series is the sum of an arithmetic sequence.

Formulas for Arithmetic Series:

$$S_n = \frac{n}{2}(a_1 + a_n)$$

$$S_n = \frac{n}{2}[2a_1 + (n-1)d]$$

where

a_1 is the first term

a_n is the n^{th} term

n is the number of terms

d is the common difference

1. Show that the sum of $(m+n)^{\text{th}}$ and $(m-n)^{\text{th}}$ terms of an A. P. is equal to twice the m^{th} term.

Answer:

Consider a and d be the first term and the common difference of the A. P. respectively.

It is known that the k th term of an A. P. is given by

$$a^k = a + (k-1)d$$

$$\therefore a_{m+n} = a + (m+n-1)d$$

$$a_{m-n} = a + (m-n-1)d$$

$$a_m = a + (m-1)d$$

$$\therefore a_{m+n} + a_{m-n} = a + (m+n-1)d + a + (m-n-1)d$$

$$= 2a + (m+n-1+m-n-1)d$$

$$= 2a + (2m-2)d$$

$$= 2a + 2(m-1)d$$

$$= 2[a + (m-1)d]$$

$$= 2a_m$$

So, the sum of $(m+n)^{\text{th}}$ and $(m-n)^{\text{th}}$ terms of an A. P. is equal to twice the m^{th} term.

2. If the sum of three numbers in A. P. is 24 and their product is 440, find the numbers.

Answer:

Consider the three numbers in A. P. be $a-d$, a , and $a+d$.

According to the given information,

$$(a - d) + (a) + (a + d) = 24 \quad \dots (1)$$

$$\rightarrow 3a = 24$$

$$\therefore a = 8$$

$$(a - d) a (a + d) = 440 \quad \dots (2)$$

$$\therefore (8 - d) (8) (8 + d) = 440$$

$$\therefore (8 - d) (8 + d) = 55$$

$$\therefore 64 - d^2 = 55$$

$$\therefore d^2 = 64 - 55 = 9$$

$$\therefore d = \pm 3$$

So, when $d = 3$, the numbers are 5, 8, and 11 and when $d = -3$,

The numbers are 11, 8, and 5.

So, the three numbers are 5, 8, and 11.