

# Deriving the summation formula of any Converged Arithmetic Series

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$$S_n = (a + (n - 1)d) + (a + (n - 2)d) + (a + (n - 3)d) \dots + (a + 2d) + (a + d) + a$$

$$S_n = a + (a + d) + (a + 2d) + \dots + (a + (n - 3)d) + (a + (n - 2)d) + (a + (n - 1)d)$$

$$2S_n = 2na + [(n - 1)d + d] + [(n - 2)d + 2d] + \dots + [2d + (n - 2)d] + [d + (n - 1)d]$$

$$2S_n = 2na + (n - 1)nd$$

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

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

$$= \frac{n}{2}(a + l) \text{ or } \frac{n}{2}(a_0 + a_n) \dots \dots \dots [\text{Answer}]$$