

PXXXX. *Proposed by Jim Jamison, the University of Memphis, Memphis, TN.*

Let $\{a_1, a_2, a_3, \dots\}$ be any sequence of real (or complex) numbers. Define

$$\rho_n := \frac{a_1 + \dots + a_n}{a_{n+1} + \dots + a_{2n}}.$$

Observe that if we consider the sequence of odd integers $\{1, 3, 5, \dots\}$ then $\rho_1 = \rho_2 = \rho_3 = \dots = \frac{1}{3}$. Define ρ to be the constant ratio, i.e. if $\rho_1 = \rho_2 = \rho_3 = \dots = \text{constant}$, then $\rho_1 = \rho_2 = \dots = \rho$.

Hence we ask for each nonzero ρ , does there exist a sequence with the property

$$\rho_1 = \rho_2 = \rho_3 = \dots = \rho? \tag{1}$$

A simpler question:

Show that if the sequence is an arithmetic progression such that $\rho_1 = \rho_2 = \rho_3 = \dots = \rho$, then $\rho = \frac{1}{3}$. Describe which arithmetic progressions meet condition (1).