Discrete Assignment

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I. Question 11.9.3.24

Show that the ratio of the sum of the first n terms of a geometric progression (G.P.) to the sum of terms from $(n+1)$th to $(2n)$th term is $\frac{1}{r^n}$.

II. Solution

TABLE 0
Input Parameters

Parameter	Description
a	First term of G.P
r	Common ratio between two consecutive terms of G.P
S_n	Sum of first n terms of G.P

Sum of first n terms,

$$S_n = \frac{a(1-r^n)}{1-r} \tag{1}$$

Sum of terms from (n+1)th to 2n th term is,

$$S_{2n} - S_n = \frac{a(1-r^{2n})}{1-r} - \frac{a(1-r^n)}{1-r} \tag{2}$$

$$= \frac{a(r^n - r^{2n})}{1-r} \tag{3}$$

Ratio ,

$$\frac{a(1-r^n)}{(1-r)} \div \frac{a(r^n - r^{2n})}{(1-r)} \tag{4}$$

$$= \frac{1-r^n}{r^n - r^{2n}} \tag{5}$$

$$= \frac{1-r^n}{r^n(1-r^n)} \tag{6}$$

$$= \frac{1}{r^n} \tag{7}$$

Hence proved.