# Maths Assignment

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## Problem Statement

A G.P consists of an even number of terms. If the sum of all terms is 5 times the sum of terms occupying odd places, then find its common ratio.

## Solution

| Parameter | Description |
|-----------|-------------|
| $n$ | Number of terms in the G.P |
| $x(0)$ | first term in the G.P |
| $r$ | common ratio in the G.P |
| $x(n)$ | nth term in the G.P |
| $y(n)$ | sum of G.P series |
| $y_o(n)$ | sum of terms in odd places |

Table 1: Input Parameters

Solving the Question in time domain:

$$x(n) = x(0)r^n \tag{1}$$

$$y(n) = x(0)(\frac{r^{n+1} - 1}{r - 1})u(n) \tag{2}$$

The sum of terms in odd places:

$$y_o(n') = x(0)\left(\frac{r^{2(n'+1)} - 1}{r^2 - 1}\right)u(n') \tag{3}$$

$$n' = \frac{n - 1}{2} \tag{4}$$

$$y_o(n) = x(0)\left(\frac{r^{n+1} - 1}{r^2 - 1}\right)u(n) \tag{5}$$

Then from (2) and (5)

$$x(0)(\frac{r^{n+1} - 1}{r - 1})u(n) = 5x(0)(\frac{r^{n+1} - 1}{r^2 - 1})u(n) \tag{6}$$

$$r^2 - 5r + 4 = 0 \tag{7}$$

$$r = 1 \quad \text{or} \quad r = 4 \tag{8}$$