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JC MATHEMATICS (H2)

STUDY TIPS

A STEP-BY-STEP GUIDE TO IDENTIFY AP AND GP

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JC_H2Maths_008

$\boxed{U_n = S_n - S_{n-1}}$

$S_n \longrightarrow U_n$ (1st) $\longrightarrow$ $U_{n+1} - U_n$ or $\dfrac{U_{n+1}}{U_n}$ $\rightarrow$ Constant $\rightarrow$ AP / GP (2nd)

Example 9

The sum of the first n terms of a series is given by $\boxed{(n+3)(n-1)}$. S_n

Show that the series is an arithmetic progression.

$S_n = (n+3)(n-1) \Rightarrow S_{n-1} = (n-1+3)(n-1-1) = (n+2)(n-2)$

$U_n = S_n - S_{n-1} = (n+3)(n-1) - (n+2)(n-2)$

$= n^2 + 2n - 3 - (n^2 - 4)$

$= 2n + 1$

$U_{n+1} = 2(n+1) + 1 = 2n + 3$

$U_{n+1} - U_n = 2n + 3 - (2n+1) = 2 = \text{Constant} \Rightarrow \text{AP}.$

Quick Practice

The sum of the first n terms of a series is given by $\boxed{2 - \left(\frac{1}{3}\right)^n}$. S_n

Show that the series is a geometric series.

$S_n = 2 - \left(\frac{1}{3}\right)^n \Rightarrow S_{n-1} = 2 - \left(\frac{1}{3}\right)^{n-1}$

$U_n = S_n - S_{n-1} = \cancel{2} - \left(\frac{1}{3}\right)^n - \cancel{2} + \left(\frac{1}{3}\right)^{n-1}$

$= \left(\frac{1}{3}\right)^n \left[-1 + \underbrace{\left(\frac{1}{3}\right)^{-1}}_{3}\right]$

$= 2\left(\frac{1}{3}\right)^n$

$\dfrac{U_{n+1}}{U_n} = \dfrac{2\left(\frac{1}{3}\right)^{n+1}}{2\left(\frac{1}{3}\right)^n} = \dfrac{1}{3} = \text{Constant} \Rightarrow \text{GP}.$

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Explanation

To find the general nth term of a series from the sum of its first n terms, the ultimate secret is universally subtracting the sum of the first (n-1) terms from the sum of the first n terms.

This exact result is absolutely critical, so always double check your work for accuracy and simplify it as much as you can. From there, your next step is to derive the (n+1)th term directly from that freshly produced nth term.

By doing this, you can easily check if the difference or the ratio between these two consecutive terms is a perfectly constant number without any n left behind, which instantly confirm whether you are dealing with an arithmetic or a geometric progression.

SIGN UP NOW BEFORE IT'S TOO LATE

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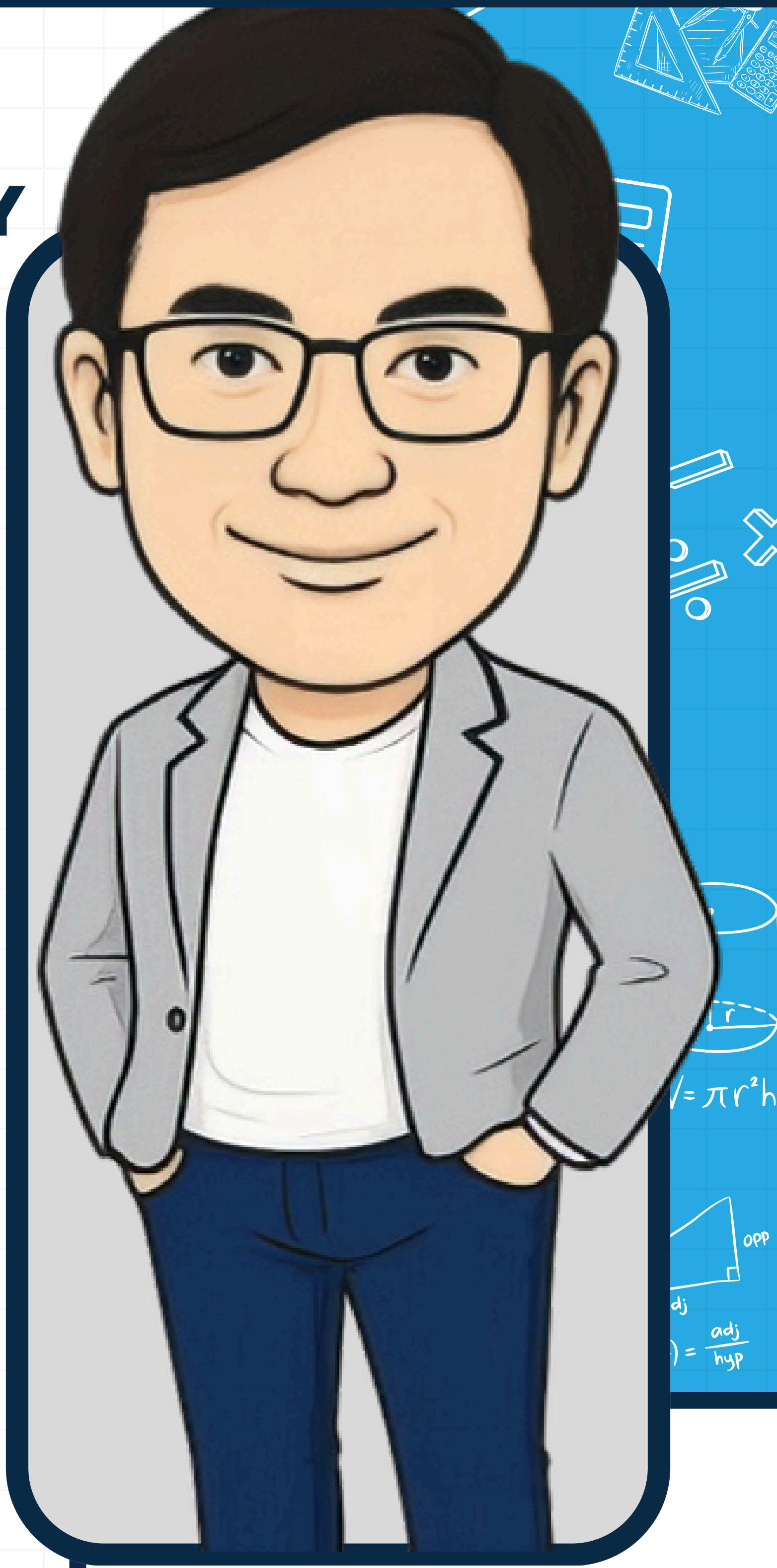

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