



PERFECT
SOLUTION
EDUCATION
GROUP

JC MATHEMATICS (H2) STUDY TIPS

**THE INSIDER SLOGAN: HOW TO
HANDLE COEFFICIENT MIXED
WITH SUM OF INDEPENDENT
OBSERVATIONS**

PREPARED BY
Mr Jackie Lee



www.h2maths.com

JC_H2Maths_009



• **Sum of n independent observations multiplied by a constant**

$$\begin{aligned}
 E(m(X_1 + X_2 + \dots + X_n)) &= E(mX_1 + mX_2 + \dots + mX_n) \\
 &= E(mX_1) + E(mX_2) + \dots + E(mX_n) \\
 &= mE(X_1) + mE(X_2) + \dots + mE(X_n) \\
 &= mE(X) + mE(X) + \dots + mE(X) \quad [n \text{ terms}]
 \end{aligned}$$

$$(iii) \quad E(m(X_1 + X_2 + \dots + X_n)) = mn E(x)$$

$$\begin{aligned}
 Var(m(X_1 + X_2 + \dots + X_n)) &= Var(mX_1 + mX_2 + \dots + mX_n) \\
 &= Var(mX_1) + mVar(X_2) + \dots + mVar(X_n) \\
 &= m^2Var(X_1) + m^2Var(X_2) + \dots + m^2Var(X_n) \\
 &= m^2Var(X) + m^2Var(X) + \dots + m^2Var(X) \quad [n \text{ terms}]
 \end{aligned}$$

$$(iv) \quad Var(m(X_1 + X_2 + \dots + X_n)) = m^2n Var(x)$$

Example 14

It is given that X is a random variable with mean 8 and standard deviation 3 and Y is a random variable with mean 5 and standard deviation 2.

If $T = 2(X_1 + X_2 + X_3) - 3(Y_1 + Y_2 + Y_3 + Y_4)$, find $E(T)$ and $Var(T)$.

$$X: m=2, n=3 \quad Y: m=-3, n=4$$

$$\text{Given: } E(X) = 8, \quad Var(X) = 3^2 = 9$$

$$E(Y) = 5, \quad Var(Y) = 2^2 = 4$$

$$E(T) = 2(3) E(X) - 3(4) E(Y) = 6(8) - 12(5) = -12$$

$$Var(T) = 2^2(3) Var(X) + 3^2(4) Var(Y) = 12(9) + 36(4) = 252$$



PERFECT
SOLUTION
EDUCATION
GROUP

JC MATHEMATICS (H2)

STUDY TIPS

Explanation

The real secret to mastering these statistics shortcuts lies in remembering two simple, high-powered slogans that unlock the entire puzzle.

For finding the average, your ultimate shortcut slogan is "mn"—you simply combine the coefficient and the number of independent observations directly.

But here is the hidden twist everyone misses when calculating the variance: the secret slogan switches to "m square n", meaning you must square that coefficient before factoring in the number of independent observations.

Once you whisper these two slogans to yourself, you can completely bypass all the tedious, step-by-step mathematical work on the page and jump straight to the final answer every single time.

This content is extracted from our lesson resources. Welcome to contact us for more tailor-made and in-depth learning.



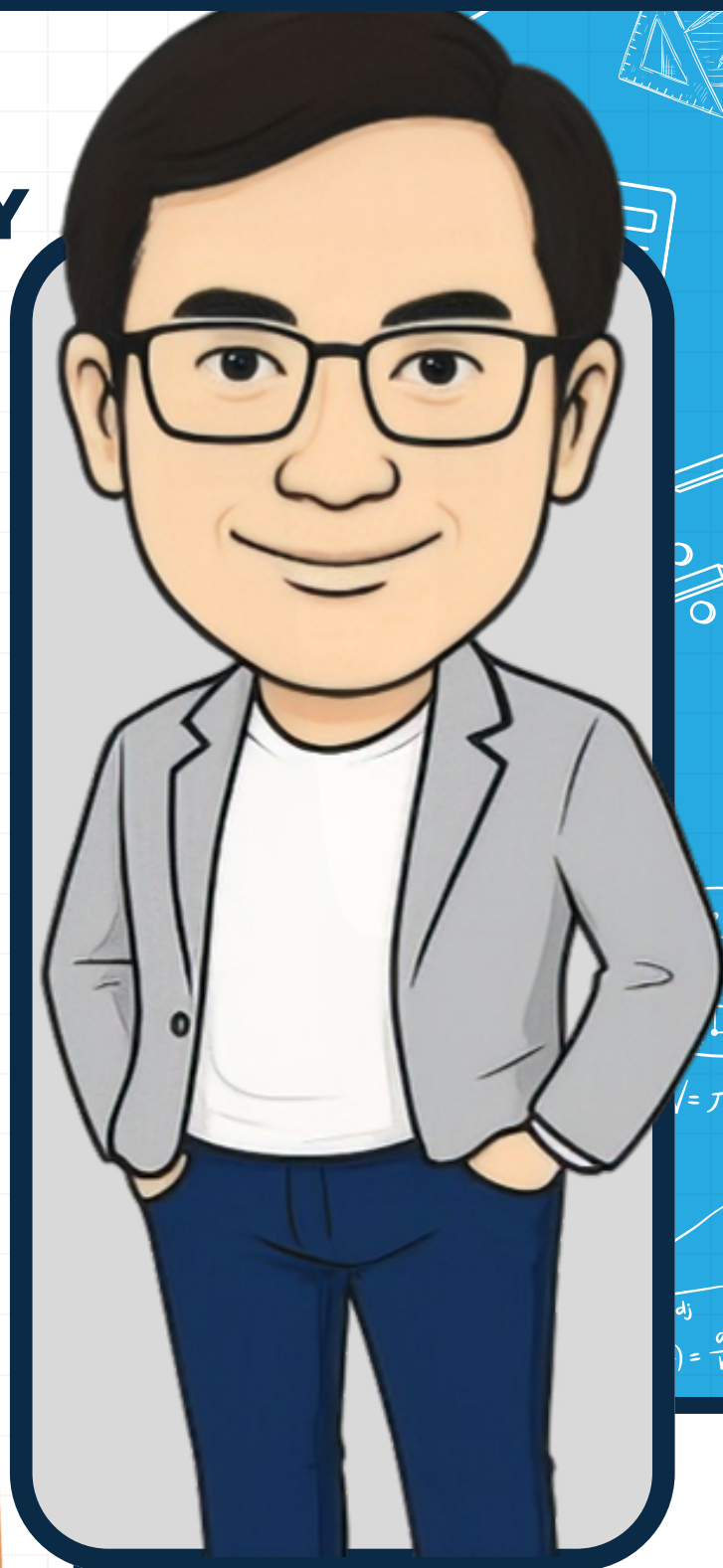
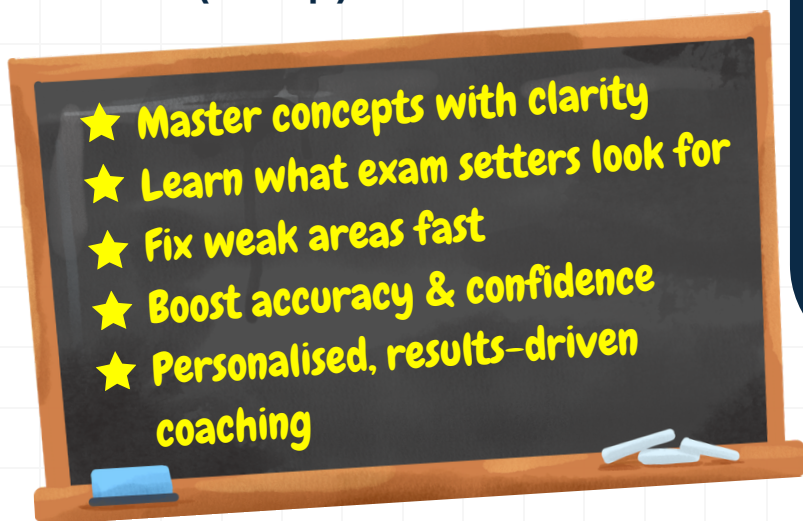
SIGN UP NOW BEFORE IT'S TOO LATE



MATHS TUITION BY MR JACKIE LEE

Online • Face-to-Face • 1-to-1 • Group

- ✓ Former MOE Scholar
- ✓ Winner of International Mathematics Competitions
- ✓ PGDE Qualification (NIE) with **Distinction in Mathematics**
- ✓ Former **School Maths Teacher** in
 - Nan Hua High School
 - Raffles Institution
 - Anglo Chinese School (Indep)



Find out more about our
classes and courses at
www.h2maths.com



Scan to
WhatsApp



90705626