> *“You smash past papers, but the moment the numbers change, panic hits.”*
> Good grades come from **spotting patterns**, not **copy-pasting answers**—and pattern-spotting grows fastest when you **create your own twists**.

The Quiet Worry in IP Homes

You top class quizzes, yet every fresh kinematics problem feels alien.

Time ticks, nerves spike, formulas fog up.

Practice papers pump answers into memory, but you rarely train yourself to see what **stays the same** when everything else changes.

My Odd Little Habit That Paid Off Big

Back in Sec 3 I used to mess with questions for fun:

- Reverse the acceleration sign
- Halve the time
- Throw the ball backwards first

I was really asking, **“Which parts actually matter?”**

That game forced me to hunt the hidden rules behind SUVAT.

Years later, researchers gave fancy names to the trick—Variation Theory, Desirable Difficulties, Generative Learning—but the core idea is simple: **tinker → guess → check**.

Try It Now — Slide, Guess, Check

<SuvatSlider />

1. Drag the sliders for u, a, t.

2. **Guess** what happens to s *before* the graph moves.
3. See if you nailed it.

That tiny guess lights up the learning centres far more than five copied worked solutions.

Quick Examples for Every SUVAT Equation

You just explored how changing u, a and t affects the distance in $s = ut + 1/2at^2$. The other four formulas tell the same story from different angles. Try these quick variations:

1. $v = u + at$ – Keep $u = 2$ m/s and set $a = -1$ m/s² for 3 s. Predict the final speed before checking the answer.
2. $s = 1/2(u + v)t$ – Start with $u = 0$, pick any final speed v and halve t. How does the distance change?
3. $v^2 = u^2 + 2as$ – A cart starts at 4 m/s and comes to rest after moving 8 m. Guess the acceleration's sign and size.
4. $s = vt - 1/2at^2$ – Throw a ball upward at $v = 10$ m/s while $a = 9.8$ m/s² downward. Estimate how far it travels in the first second.

Make a rough guess each time, then verify. The aim isn't perfect accuracy – it is building a feel for how one tweak ripples through the rest of the numbers.

See Equation 3 in Action — Velocity–Time Area

A **one-minute derivation** of $v^2 = u^2 + 2as$ (no memorising needed):

1. **Straight-line $v - t$ graph.** It begins at u and reaches v after a time t.
2. **Area under the line gives displacement.**
   [s = (1/2)(u+v)t]
3. **That same picture also tells you the width.**
   The slope is a, so $t = (v - u)/a$.
4. **Substitute and tidy.**
   $s = (1/2)(u + v)(v - u)/a = (v^2 - u^2)/(2a)$.
5. **Multiply by $2a$ and Re-arrange:** $v^2 = u^2 + 2as$.

Drag the sliders below and **focus on how** v, u, a, s co-operate in $v^2 = u^2 + 2as$.

Feel free to move t — that just stretches the trapezium sideways — but remember the equation itself ignores t.

The initial values are set up to mirror the problem statement 3 in the previous section:

> A cart starts at 4 m/s and comes to rest after moving 8 m. Guess the acceleration's sign and size.

<SuvatArea />

Things to try

- Keep u fixed, change a. Watch v and the shaded area s grow or shrink exactly so that $v^2 - u^2 = 2as$ stays true.
- Flip the sign of a or choose $u > v$ and see the area turn negative — a neat reminder that displacement has direction, not just size.
- Vary t for the same u and a. Notice how the values of v and t change together.

Why Guess-and-Tinker Super-Charges Memory

- Making a guess forces your brain to *code* the idea into memory.
- Tweaking one number at a time reveals the **unchangeables**—the patterns examiners love.
- Quick feedback tightens the “wrong-prediction → fix-prediction” loop that builds rock-solid intuition.

How to Build the Habit (IP Year 3 Plan)

1. After each homework set, invent **two** new versions. Write your guess, then the real answer.
2. Change **one thing at a time** before mixing tweaks.
3. Push extremes: let $a = 0$ or $t \to 0$. Does the maths match your gut?
4. End each week by revisiting the surprises—they're the gold.

Why IP Students Need This Even More

- Inquiry projects and wild internal papers reward flexible thinking.
- Schools pack A-Level ideas early, so depth beats drill from Day 1.
- Paper styles swing between schools; generative practice is your seatbelt.

Our Class = Your Lab

- Max **8 students** → we read *every* homemade question and show you how to improve it.
- 24/7 WhatsApp lifeline → snap a pic of your tweak, get a quick voice note back.

Grab a Free 15-min Physics Check

Tap the green WhatsApp button and we'll spot the single SUVAT slip costing you marks—no strings attached.

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FAQ

Fastest way to level up SUVAT?
Invent and tweak your own questions. Creation beats repetition.

When do IP students learn SUVAT?
Usually in Year 3 (Sec 3).

IP vs O-Level Physics—what's different?
IP dives deeper, earlier, and papers change style often. You need concepts, not scripts.

Read More

1. Marton & Booth – Variation Theory
2. Bjork & Bjork – Desirable Difficulties
3. Fiorella & Mayer – Generative Learning
4. Roediger & Karpicke – Retrieval Practice