

THE DERIVATION SCAFFOLD

Four lines, in the order the paper asks for. The answer on its own never earns the point for the working.

The paper tells you how to start. Every question that says *derive* on the 2025 and 2026 exams carries this instruction:
“Begin your derivation by writing a fundamental physics principle or an equation from the reference information.”
On the 2023 exam it did not appear once. It is not advice. It is the first line.

How it goes on a real question

AP Physics 1, 2025, Question 2, Part B

A block of mass M is released from rest at $x = 0$ on a frictionless ramp of angle θ . At $x = 8D$ it meets an uncompressed spring; it momentarily comes to rest at $x = 12D$. “Starting with conservation of energy, derive an equation for the spring constant k . Express your answer in terms of M , θ , D ...”

THE STEP	SAY IT IN WORDS	WRITE THE LINE	2025 SCORE
1 PRINCIPLE or an equation off the sheet	Energy is conserved for the block–spring–Earth system.	$E_0 = E_f$	point B1 0.64
2 THIS SITUATION name the terms here	It starts as gravitational potential energy and ends as spring potential energy.	$U_g = U_s$ $mg\Delta y = \frac{1}{2}k(\Delta x)^2$	point B2 0.48
3 SUBSTITUTION this problem’s letters	Sliding $12D$ down the ramp drops the block $12D \sin \theta$; the spring compresses $4D$.	$Mg(12D \sin \theta) = \frac{1}{2}k(4D)^2$	point B3 0.38
4 ANSWER only letters the prompt lists	Solve for k .	$k = \frac{3}{2} \frac{Mg \sin \theta}{D}$	point B4 0.17

The right-hand column is the College Board’s printed answer — all five of its lines, laid into the four rows — and the bars are what each point averaged across 174,992 students in 2025. B1 is paid not for line 1 but for working that runs past one line with the principle in it, which a bare answer cannot show.

Now you

Problem _____

1 PRINCIPLE or an equation off the sheet	
2 THIS SITUATION name the terms here	
3 SUBSTITUTION this problem’s letters	
4 ANSWER only letters the prompt lists	

BEFORE YOU HAND IT IN. 1. Line 1 is a fundamental physics principle, or an equation you can point at in the reference information — never one you built for this problem. 2. Every letter in line 4 is on the prompt’s *in terms of* list, and none that is not. 3. The working is on the page even when you saw the answer at line 1 — that is exactly the day the point goes missing.

What the sheet on the front is built from

Asked for in print by the people who score the exam, then checked against the responses they scored.

The readers asked for this object

Chief Reader Reports

2024, Q1, p. 3. “The AP 1 workbook has scaffolding for derivation practice. The workbook suggests a two-column chart where the words for each step are on the left side, and the math steps are on the right.” **2025, Q4, p. 13** says it again: “... the words explaining the step are on one side and the math steps are on the other.” Both point at the College Board’s own *AP Physics 1 Student Workbook*, and the 2024 bullet names the pages — “3D, 3E, and 4G.” What the front of this sheet adds is what those pages do not carry: which rubric point each row serves, and what each point was worth in 2025.

The rows are not mine either. Question 5 of 2023 was that year’s lowest-scoring question — mean **1.57 out of 7** — and its misconception table names the failure in one line: “When a derivation is asked for, only one line of work is shown.” The advice block on the same page answers it (**2023, Q5, p. 16**):

“Derived equations should always start with a law or equation from the equation sheet. When working on derivations, require that derivations contain at least three separate lines: 1. A starting law or equation from the equation sheet. 2. Explicit substitutions of variables and constants from the problem. 3. The algebraically manipulated final expression.”

Four rows rather than three, because the 2025 rubric pays separately for naming the terms and for substituting the problem’s letters — points B2 and B3. That fourth row is the sheet’s one editorial decision. **One caveat, stated plainly:** 2023 is before the redesign — the current course description took effect in Fall 2024 — so that quotation does not on its own describe the exam students sit now. It survives because the 2025 rubric pays for it independently and the 2026 paper still prints the instruction, both below.

The paper started saying it, and the rubric started paying for it

2023–2026

Times the sentence “Begin your derivation by writing a fundamental physics principle or an equation from the reference information” appears in the released free-response questions: **2023 — none. 2024 — twice. 2025 — four times. 2026 — four times.** The wording settled late: both 2024 instances say “the reference book,” “reference information” is the phrasing from 2025 on, and 2026 Q2 varies *a* to *the*. In 2023 the derivation prompts stopped at *express your answer in terms of*.

Three of the four 2025 questions now carry a point awarded, verbatim, “for a multistep derivation that includes” a named principle — Q1 A5, Q2 B1, Q4 B1 — and each of those parts also carries a Scoring Note saying what a bare correct answer buys:

Q1 A(iii): “A correct, isolated, final expression of ΔK ... earns points A3, A4, A6, and A7.” **Q2 B:** “A correct, isolated, final expression of k ... earns points B2, B3, and B4.” **Q4 B:** “A correct, isolated, final expression for a earns points B2 and B3.”

Three for three the list stops one point short of the part, and the missing point is the multistep line every time — which is also the highest-scoring point of its own derivation in all three (A5 0.72, Q2 B1 0.64, Q4 B1 0.72).

It is not a fee for writing line 1, though, and the Sample Responses settle that. On 2025 Q2 a scored response earned B1 “because the response presents a multistep derivation that includes conservation of energy, as indicated by the statement ‘Maximum U_g = Maximum U_s ’” — and that same single line “also earned point B2 ...” In both responses that earned B1, the line that earned it was the line naming the two energies — not a principle written out on its own. So the instruction on the front of this sheet is the exam paper’s, not an inference from the rubric.

Where the derivation goes, and where the scaffold bends

2025, Q2, pp. 5–6

The four bars on the front are one derivation’s point means — 0.64, 0.48, 0.38, 0.17 — and the Chief Reader’s prose runs in the same order: “Approximately 66% of responses included conservation of energy in the derivation,” “only around half correctly related initial and final energy values ...,” “Approximately 40% of responses correctly identified the substitutions for either the change in height ... or the distance the spring compresses,” and “Less than 20% of responses correctly combined all steps in the derivation and arrived at a correct final expression ...” 2025 is the first report to give a mean per rubric point rather than per question.

Four rows is a habit, not an arithmetic. Q2 is the only 2025 derivation carrying four points. Q1 A(ii) carries two and pays nothing for the final line; on Q4 B the substitution row is a second reference equation, $F_b = \rho V g$, not the problem’s geometry. The order holds everywhere; the count does not.

And what the readers suggested doing with it

their words, not mine

2024, Q1, p. 3. “For derivations, model this practice on the board for students throughout the year. Starting more so in the fall and tapering off in the spring ... Have students practice derivations with groups on whiteboards and follow up with individual practice.” **And on the same page:** “For derivations, type up a derivation step by step. Print it out and cut it up. Provide students with the cut-up derivation and ask them to put the cards in the correct order and justify their work.”