Question-Type Playbook

Edexcel A-Level Maths (9MA0) & Physics (9PH0) — how to open every question type

Contents

Part 1 — Maths

◆ Show-that / prove-that (Maths)

RECOGNITION SIGNALS

"Show that…", "Prove that…, hence…", "…deduce that…", "…verify that…". The target is handed to you; marks are for the argument, not the answer.

OPENING MOVE

Before anything, write the target result as the LAST line of your working with a box around it. Now your job is to reach that line. Don't start from the target — examiners mark forward.

METHOD TEMPLATE

1. State the definition / identity / formula you'll use (often 1 mark on its own)
2. Do one algebraic step at a time, each on a new line
3. Beside each step, write WHY in a short comment (e.g. "using $\sin^2+\cos^2=1$")
4. Finish with "as required" or "QED" and underline the matched line

MARK-GRABBING MOVES

Quoting the named identity/formula (1 mark). Any correctly-manipulated intermediate line (method mark). A clear "as required" tying the last line to the target (1 mark). Never skip the concluding sentence even if it feels obvious — the examiner awards it explicitly.

COMMON TRAPS

Working BACKWARDS from the target and calling it a proof (examiner reports flag this every year). Skipping the "why" comments so the examiner can't follow your logic. Dropping a minus sign mid-way — unlike a "find" question there's no check value at the end, so errors go uncaught.

WORKED EXAMPLE

ex1011 *— Maths P1 · Show that a trig equation reduces to a standard form. Start with the target boxed, apply $\sin^2+\cos^2=1$, collect terms, match form.*

IF STUCK

Write down anything related to the target: the identity, a rearrangement of either side, the definition. The first 1–2 marks are almost always for setup, not completion.

◆ Proof from first principles (Maths)

RECOGNITION SIGNALS

"Prove, from first principles…", "Using the definition of…", "Show, using limits…". Almost always derivatives, series, or divisibility. Different from show-that: here there's a *named method* you MUST use.

OPENING MOVE

Write the DEFINITION at the top of the page before touching the algebra. For differentiation: f′(x) = lim(h→0) [f(x+h) – f(x)] / h. That one line is often a mark on its own.

METHOD TEMPLATE

1. Quote the definition explicitly (1 mark)
2. Substitute the specific function into the definition
3. Expand and simplify the numerator — keep every term
4. Divide through by h before taking the limit
5. Take the limit and state the conclusion

MARK-GRABBING MOVES

Writing the definition (1 mark). Correct substitution (1 mark). Correctly cancelling h before the limit step (1 mark) — don't take the limit with h still in the denominator or you've divided by zero. Clear final line linking back to the statement to prove.

COMMON TRAPS

Using a rule (e.g. power rule) in a first-principles question — automatic zero. Taking the limit before cancelling h. Forgetting the limit notation on every line where h still appears. Skipping the definition because "it's obvious".

WORKED EXAMPLE

ex1009 *— Maths P1 · Prove from first principles that d/dx(x³) = 3x². Classic: definition → (x+h)³ expansion → cancel h → take h→0.*

IF STUCK

Even if you can't finish, writing the definition and correct substitution is typically 2 of 4–5 marks. Always start there.

◆ Calculation / find (Maths)

RECOGNITION SIGNALS

"Find…", "Calculate…", "Evaluate…", "Determine the value of…". The answer is a specific number, expression, or function. Usually 3–6 marks, no context.

OPENING MOVE

Underline the exact thing being asked (the expression, not the variable). Write the technique you're about to use in 2 words at the top of your working ("integration by parts", "chain rule", "quotient rule") — it tells you and the examiner what you're doing.

METHOD TEMPLATE

1. Identify the technique (integration, differentiation, solving)
2. Write the general formula for that technique
3. Substitute your specific values or expressions
4. Simplify step by step — don't skip
5. State the final answer clearly, boxed, in simplest form

MARK-GRABBING MOVES

Quoting the formula used (often a method mark). Correct substitution. Any single correctly-simplified line. The final answer in simplest form (the examiner will NOT simplify your 4/8 to 1/2 for you). Include "+c" on every indefinite integral.

COMMON TRAPS

Forgetting +c on indefinite integrals (1 mark gone). Not simplifying to the form the mark scheme wants. Arithmetic slips on the last line after a correct method — always sanity-check by substituting back if possible. Calculator mode left in radians when the question uses degrees (or vice versa).

WORKED EXAMPLE

ex1000 *— Maths P1 · ∫(■x^3 – 6√x + 1)dx. Raise power, divide by new power, add +c, simplify.*

IF STUCK

Write the formula and the substitution step even if you can't finish the algebra — those are often half the marks. Partial method gets partial credit.

◆ Algebraic manipulation (Maths)

RECOGNITION SIGNALS

Questions where the answer IS an algebraic expression in a target form, or where you must rearrange, factorise, or simplify a given expression. Clue words: "express in the form…", "write as a single fraction", "in terms of…".

OPENING MOVE

Look at the TARGET FORM the question asks for and write it at the bottom of your page. If it says "in the form a + b√3", you already know the end shape. That gives you a visual target to aim at and often reveals the technique (rationalise, complete the square, combine fractions).

METHOD TEMPLATE

1. Identify the target form (single fraction / a+b√c / quadratic / etc.)
2. Pick the technique that maps current form → target (common denominator, expand, factor, rationalise)
3. Do ONE operation per line — don't combine steps
4. Simplify at the end, matching the target form exactly

MARK-GRABBING MOVES

Correct common denominator (1 mark). Each correctly expanded/factorised line (method marks). Matching the exact target form with no unnecessary terms (final accuracy mark).

COMMON TRAPS

Forgetting to distribute a negative sign across a bracket. Cancelling terms that aren't factors (e.g. cancelling x in (x+2)/(x+3) — illegal). Leaving the answer in a form the mark scheme won't accept (e.g. 2/√3 instead of 2√3/3).

WORKED EXAMPLE

ex1005 *— Maths P1 · Company toy problem. Set up the algebraic model, then manipulate to isolate the target variable.*

IF STUCK

Expand everything into the simplest form you can, then look for common factors. Brute force beats elegance for partial credit.

◆ Explain / justify (Maths)

RECOGNITION SIGNALS

"Explain why…", "Give a reason for…", "Justify your answer", "State, with a reason…". Usually 1–3 marks. Prose answer required — not a calculation.

OPENING MOVE

Answer in ONE sentence if possible. Start with "Because…" or "Since…". Before writing, identify the MATHEMATICAL FACT being tested (gradients of perpendicular lines, discriminant < 0, derivative at a max is zero, etc.) — name it explicitly.

METHOD TEMPLATE

1. Name the mathematical fact/rule in play (1 mark)
2. Apply it to the specific situation in the question (1 mark)
3. State the conclusion if asked

MARK-GRABBING MOVES

Using the correct technical vocabulary — "perpendicular because gradients multiply to –1", not "they meet at 90°". Referencing the specific values in the question, not general principles.

COMMON TRAPS

Waffling — every extra sentence risks contradicting yourself and losing marks. Geometric intuitions ("looks vertical") get zero; you need the algebraic reason. Answering with a calculation instead of prose.

WORKED EXAMPLE

ex1003 *— Maths P1 · Explain why two lines are perpendicular. One sentence: "Because gradient of l■ × gradient of l■ = (3/4)(–4/3) = –1."*

IF STUCK

Write down the relevant definition or rule and apply it verbatim to the numbers in the question. "Because the discriminant $b^2–4ac = 16 > 0$, there are two real roots" is a complete 2-mark answer.

◆ Model critique / "criticise this model" (Maths)

RECOGNITION SIGNALS

A real-world context where a model is proposed. Marks are for commenting on the model's validity. Keywords: "Give a limitation of this model", "Suggest a refinement", "Criticise the student's method", "Is the student's answer reasonable?".

OPENING MOVE

State the assumption the model makes that you're attacking. E.g. "The model assumes air resistance is zero". Every limitation answer follows the pattern: "The model assumes X, but in reality Y, therefore Z."

METHOD TEMPLATE

1. Identify one specific assumption (not a vague one)
2. Explain why that assumption fails in the real context
3. Say what effect the failure has on the predicted value (over/under-estimate)
4. If asked for a refinement: propose a concrete change, not "make it more accurate"

MARK-GRABBING MOVES

Naming a SPECIFIC assumption (1 mark). Linking it to the specific context in the question (1 mark). Stating the direction of the error if asked (over- vs under-estimate).

COMMON TRAPS

Writing "the model is not accurate" with no reason — zero marks. Generic limitations ("real life is complicated") — zero. Criticising something the model doesn't actually assume. For student-method critiques: the error is usually a specific algebraic or logical step, not the whole approach.

WORKED EXAMPLE

ex1004 *— Maths P1 · A student's attempt to solve an exp/log equation. Pinpoint the specific line where they went wrong and why.*

IF STUCK

"The model assumes [X] is constant, but in reality [X] changes over time, so the answer will be [over/under]-estimated." This sentence scaffold earns 2 marks on almost any modelling question.

◆ Interpret / "what does this mean" (Maths)

RECOGNITION SIGNALS

You're handed a model and asked to interpret a specific part: "What does the constant k represent?", "Interpret the value 500 in context", "What does dV/dt = 0 tell you?". 1–3 marks each.

OPENING MOVE

Answer with UNITS. Every interpretation in a real-world context must state units (£, people, m/s, years). Before writing, identify what the quantity is measuring and what its units tell you.

METHOD TEMPLATE

1. State what the quantity represents (with units)
2. Link to the specific context in the question (painting value, population, height)
3. If a rate (dy/dx or dy/dt): say "rate of change of [y] with respect to [x]" then what that means in context

MARK-GRABBING MOVES

Correct units (half the battle). Referencing the context variable names from the question (not generic x/y). For exponential models: stating whether it's initial value, growth rate, or long-term limit.

COMMON TRAPS

Answering with a number but no units. Generic interpretations ("it's the coefficient") — useless. Forgetting that in exp(–kt), the value at t=0 is the INITIAL value, not the final one.

WORKED EXAMPLE

ex1012 *— Maths P1 · Painting value V = A·e^(kt). Interpret A (initial value in £ at t=0) and k (continuous annual growth rate).*

IF STUCK

Plug t=0 into the model and see what comes out — that's almost always what a constant represents. For a rate, compute it at one specific t and describe what that number means in the context.

◆ Hence / hence or otherwise (Maths)

RECOGNITION SIGNALS

Part (b) says "Hence…" or "Hence, or otherwise…". Signals that part (a)'s result is a STEPPING STONE you must use in part (b).

OPENING MOVE

Write down part (a)'s result clearly at the top of part (b) even if you already have it — you'll refer back to it. "Hence" means you MUST use (a); "hence or otherwise" means you don't have to but it's the intended path.

METHOD TEMPLATE

1. Quote part (a)'s result with a label (e.g. "From (a): f(x) = (x–2)(2x²+3x–1)")
2. Apply the result to the new sub-question (solve, differentiate, substitute)
3. Complete whatever the new question asks

MARK-GRABBING MOVES

Using part (a) explicitly and showing it was used (the word "hence" in your working signals this to the examiner). Partial credit is generous here if (a) was right — examiners want to reward you for chaining parts.

COMMON TRAPS

Re-doing part (a) from scratch when "hence" told you to use it — wastes time and you may miss the intended shortcut. Ignoring part (a)'s result entirely ("otherwise" is legal but usually longer). Getting part (a) wrong then using the wrong result in (b) — you'll still get method marks in (b) if the working is logical.

WORKED EXAMPLE

ex1017 *— Maths P1 · Given an integration result in (a), hence find a definite integral in (b). Use the antiderivative from (a) directly.*

IF STUCK

Even if (a) was wrong, carry it forward into (b). You'll still collect method marks in (b) for applying a correct chain of reasoning to your (incorrect) (a).

◆ Diagram question (Maths)

RECOGNITION SIGNALS

A figure is given. Usually geometry, coordinate geometry, calculus (area under curve), trigonometry, or vectors. Marks are often for extracting information from the diagram.

OPENING MOVE

COPY THE DIAGRAM onto your answer paper and add every given value, every angle, every coordinate. Label anything the question asks you to find with a letter if it doesn't have one. This act alone often reveals the method.

METHOD TEMPLATE

1. Redraw with all labels and values
2. Identify the geometric / trig / calculus relationship being used (similar triangles, Pythagoras, trig ratio, area under curve)
3. Write the general relationship with letters
4. Substitute the labelled values
5. Solve

MARK-GRABBING MOVES

A clear labelled diagram (sometimes worth a mark directly). Identifying the correct relationship. Stating which triangle / region / formula you're using.

COMMON TRAPS

Working from a scrappy re-drawing where you mixed up two angles. Assuming the diagram is to scale — it never is. Not using ALL the information given (if a value is in the diagram, it's usually needed).

WORKED EXAMPLE

ex1008 *— Maths P1 · Factor theorem problem with a cubic curve diagram. Label intercepts, use the diagram to identify factors, then verify algebraically.*

IF STUCK

Add auxiliary lines or points to the diagram — a perpendicular from a vertex, a diameter, a line joining two key points. The construction itself often points to the method.

◆ Multi-part question (Maths)

RECOGNITION SIGNALS

Parts (a), (b), (c)… usually 6–14 marks total. Later parts often build on earlier ones.

OPENING MOVE

Read ALL parts before starting (a). This tells you where you're heading — the final part is the goal and earlier parts are scaffolding. If (c) needs a value of k, check whether (a) or (b) gives you k.

METHOD TEMPLATE

1. Read parts (a) → (last) in order
2. Identify which parts are stepping stones (usually signalled by "hence" or shared variables)
3. Do them in order; label each part clearly (a), (b), (c)
4. Carry forward results from earlier parts explicitly

MARK-GRABBING MOVES

Clearly labelling each part so the examiner doesn't mis-mark. Carrying forward errors correctly — a wrong (a) doesn't fail (b) if (b)'s method is right given your (a).

COMMON TRAPS

Starting (a) without reading (b)(c) — wastes time on the wrong approach. Not labelling which part your working belongs to — examiner can't find the marks. Skipping a short part because it looks trivial; those 1-mark parts are often gifts.

WORKED EXAMPLE

ex1002 *— Maths P1 · Vectors problem with (a) find a coordinate, (b) use the result to compute a distance.*

IF STUCK

If part (c) is blocked, quote what you'd do from part (b) — examiners often give method marks for the right plan even if you can't execute.

Part 2 — Physics

◆ Show-that (Physics)

RECOGNITION SIGNALS

"Show that the speed is approximately 12 m/s", "Show that the resistance is about 4.5 Ω". The answer is given (usually to 1–2 sig figs); marks are for the derivation.

OPENING MOVE

Write the target value boxed at the bottom of your working. Identify which equation connects the given quantities to the target — usually one from the data sheet. Note the UNITS of the target: they tell you which equation to use.

METHOD TEMPLATE

1. Quote the equation from the data sheet (1 mark)
2. State what each symbol represents and its value
3. Substitute, keeping units through the calculation
4. Compute — give MORE sig figs than the target so it's clear you arrived there, not rounded from above
5. Finish with "≈ [target value]" matching the question's precision

MARK-GRABBING MOVES

Quoting the correct equation (1 mark). Correct substitution with units (1 mark). Final answer to at least one more sig fig than the target, then rounded.

COMMON TRAPS

Rounding too early and missing the target by 1 in the last digit. Using g=10 when the question uses g=9.81 (check the value given). Forgetting to convert units (cm→m, minutes→s, °C→K). Writing "= [target value]" when your calculation gave 12.3 and the target was 12 — be explicit it's an approximation.

WORKED EXAMPLE

ex1301 *— Physics P1 · Shot put. Use projectile motion equations to show the speed at release is approximately [value]. Quote $v^2 = u^2 + 2as$, substitute, compute.*

IF STUCK

Write the equation and substitute given values. Even if arithmetic fails, you typically get 2/3 marks for the right setup.

◆ Calculation (Physics)

RECOGNITION SIGNALS

"Calculate the…", "Determine the value of…". Specific numerical answer with units. Usually 2–5 marks.

OPENING MOVE

List KNOWN and UNKNOWN at the top of the page with units. Convert everything to SI units BEFORE substituting. Identify the equation that links them — usually from the data sheet; quote it explicitly.

METHOD TEMPLATE

1. List given quantities with units in SI
2. Convert if needed (km→m, g→kg, °C→K)
3. Quote the relevant equation (from data sheet)
4. Rearrange symbolically BEFORE substituting numbers
5. Substitute and compute
6. Check units and significant figures (match the data's precision, usually 2–3 s.f.)

MARK-GRABBING MOVES

Correct equation (1 mark). Correct rearrangement (1 mark). Substitution with correct unit conversions (1 mark). Answer with correct unit AND sig figs (often a final mark). Never drop the unit — it's worth marks on its own.

COMMON TRAPS

Unit mistakes (km vs m, minutes vs seconds, g vs kg). Using the wrong g value (9.81 vs 10). Calculator in the wrong mode. Wrong sig figs — if data is 2 s.f., don't give 4 s.f. Forgetting the unit on the final answer.

WORKED EXAMPLE

ex1291 *— Physics P1 · Trolley mass calculation using Newton's laws. List F, a, find m = F/a, include units.*

IF STUCK

Write the equation and substitute with whatever you have. Substitution = method marks even if the arithmetic is wrong.

◆ Explain / describe (Physics)

RECOGNITION SIGNALS

"Explain why…", "Describe how…", "Suggest a reason for…". Prose answer, 2–6 marks. Mark scheme lists specific points; you need to hit them.

OPENING MOVE

Count the marks. An answer worth N marks has N distinct physics ideas. Plan N bullet points before writing. Each point should reference a physics principle (conservation of momentum, Newton's third law, ohmic behaviour, etc.) — not a common-sense observation.

METHOD TEMPLATE

1. Plan N physics points for an N-mark question
2. Write each as a standalone sentence linking a named principle to the specific scenario
3. Use correct technical vocabulary (not "speed" when you mean "velocity", not "force" when you mean "pressure")
4. Connect points with "therefore", "because", "hence" to show causal chain

MARK-GRABBING MOVES

Each named physics principle (Newton's 3rd, conservation of momentum, flux linkage, etc.) = typically 1 mark. Correctly applying it to the scenario = another mark. Technical vocabulary over layman's terms.

COMMON TRAPS

Writing one long paragraph — examiners look for discrete points, not a story. Using the word "force" where you mean "resultant force", or "energy" where you mean a specific type. Common-sense answers ("the car stops because it runs out of energy") — you need to say WHICH energy and by what mechanism.

WORKED EXAMPLE

ex1300 *— Physics P1 · Cyclist video analysis. 6 marks = 6 points. Include: resultant force, air resistance increases with speed, terminal velocity when F_net=0, Newton's 2nd law applied specifically.*

IF STUCK

For each mark, write one sentence naming a physics term and applying it. Even bullet points are acceptable — examiners mark per point, not per paragraph.

◆ Diagram question (Physics)

RECOGNITION SIGNALS

Circuits, force diagrams, ray diagrams, field patterns, apparatus. Marks are for reading information off the diagram AND for drawing on it when asked.

OPENING MOVE

If the question says "add to the diagram" or "show on the diagram", DRAW first, then write your explanation. Label every arrow (direction + magnitude), every component, every angle. Read every given numerical value off the diagram and list them with units at the top of your working.

METHOD TEMPLATE

1. Read ALL values off the diagram; list at the top with units
2. If force diagram: draw arrows for every force acting on the body, labelled with cause (weight, normal, tension…)
3. If circuit: trace the current path, identify series/parallel groupings
4. If ray diagram: apply the appropriate rays (parallel, through focal point, through centre)
5. Apply the relevant physics (ΣF=ma, Kirchhoff's laws, lens equation)

MARK-GRABBING MOVES

Correct free-body / force diagram (often 1–2 marks on its own). Correctly identifying series vs parallel in circuits. Every labelled arrow. Drawing something IN the diagram when asked (not just describing it below).

COMMON TRAPS

Missing a force (normal force, friction, air resistance). Drawing arrows not starting/ending at the body. Assuming components are in parallel when they're series. Treating a diagram as to-scale when it isn't. Not using values given in the diagram.

WORKED EXAMPLE

ex1293 *— Physics P1 · Object of given mass on an inclined surface. Free-body diagram with weight, normal, friction; resolve along slope.*

IF STUCK

Draw the free-body diagram even if you can't continue. The diagram itself is usually worth marks.

◆ Model critique / evaluate (Physics)

RECOGNITION SIGNALS

"Evaluate the student's model", "Suggest a limitation", "Comment on the validity of the assumption", "Criticise the experimental method". Found at the end of long multi-mark questions (often the last 3–6 marks).

OPENING MOVE

Name a SPECIFIC physical effect the model ignores. Template: "The model assumes [X is negligible], but in reality [physical effect Y] means [direction of error]."

METHOD TEMPLATE

1. Pick one specific assumption (air resistance negligible, spring perfectly elastic, friction zero, etc.)
2. Name the real-world physical effect the assumption ignores
3. State whether the model's prediction is an OVER- or UNDER-estimate as a result
4. If asked for improvement: propose a specific extra term or refined measurement, not "use better equipment"

MARK-GRABBING MOVES

Naming a specific assumption (1 mark). Naming the physical effect that breaks it (1 mark). Stating the direction of error (1 mark). Specific refinements (use more accurate instrument, smaller time steps, control for X) vs vague ones.

COMMON TRAPS

"The model is not realistic" — zero. "Friction is ignored" without saying what the effect would be — half credit. Criticising the model for something it doesn't actually assume. For extended-writing marks: examiners want a STRUCTURED argument (strength → limitation → improvement), not a list.

WORKED EXAMPLE

ex1319 *— Physics P1 · Beam engine efficiency. Identify that the model ignores heat loss via conduction/radiation, so actual efficiency < predicted.*

IF STUCK

"The model assumes [X] is constant, but [physical effect] means [X] changes during the process, leading to an [over/under]-estimate." This scaffold earns 2–3 marks on almost any evaluate question.

◆ Multi-part question (Physics)

RECOGNITION SIGNALS

Long question with parts (a)(i), (a)(ii), (b), (c)… Often a single context (an experiment, a mission, a device) explored from multiple angles. Usually 8–14 marks total.

OPENING MOVE

Read the WHOLE question including the final part before starting. The final part is often the "money" question (high marks, synoptic). Earlier parts give you results (numbers, equations) you'll need later — underline them as you go.

METHOD TEMPLATE

1. Read all sub-parts before starting
2. Identify which parts give numerical results that later parts use
3. Answer in order; label each part clearly (a)(i), (a)(ii), (b)…
4. Carry forward earlier numerical results explicitly
5. For the final extended-writing part, plan bullet points before writing

MARK-GRABBING MOVES

Labelling each part so marks aren't lost to mis-matching. Carrying forward values — examiners credit correct METHOD even if an earlier value was wrong. Synoptic links in the final part (referring back to earlier results) often earn an extra mark.

COMMON TRAPS

Starting immediately on (a) without reading (d) — you miss what earlier parts were scaffolding. Not carrying numerical results forward (re-deriving instead). Treating the final long-answer part as if it's independent — it's usually a synthesis of everything above.

WORKED EXAMPLE

ex1302 *— Physics P1 · Proton beam therapy. (a) calculate energy, (b) compare to X-rays, (c) evaluate the method. Each part feeds the next.*

IF STUCK

If a part is blocked, assume a plausible value for what it would yield and carry it forward into the next part. Examiners give method marks for the onward working even if the blocked value is wrong.