GCSE ONLINE TUTORING

IN PARTNERSHIP WITH RS REMOTE TUTORING

HIGHER MATHEMATICS

COMMON MISTAKES, EXAMINER EVIDENCE & DIAGNOSTIC REPAIR HANDBOOK

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Evidence method

This handbook does not invent frequency percentages. Entries marked with ER references are grounded in published Higher Mathematics course reports. The reports themselves use controlled language such as “most”, “many”, “some” and “a few”; this handbook preserves that evidence level rather than converting it into unsupported numerical claims.

01. Fractions and negative numbers

Area: Basic numeracy

What goes wrong: Numerical inaccuracies propagate into otherwise-correct Higher methods.

Repair routine: Maintain a short non-calculator fluency routine; simplify signs/fractions before advanced manipulation.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER22, ER23, ER24, ER25, ER26

02. Inconsistent equalities or algebra lines

Area: Mathematical communication

What goes wrong: A correct final expression may not receive full credit if intermediate statements are mathematically false.

Repair routine: Use one valid transformation per line; read every equals sign as “is exactly equal to”.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER25, ER26

03. Omitting +c

Area: Integration

What goes wrong: Indefinite integration and differential-equation solutions become incomplete.

Repair routine: Write +c immediately after integrating, before applying any initial condition.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER22, ER25, ER26

04. Failing to convert log/exponential form

Area: Logarithms

What goes wrong: Candidates stall or use invalid cancellation.

Repair routine: Practise bidirectional conversion and apply log laws before calculator evaluation.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER23, ER25, ER26

05. Applying only one transformation or wrong direction

Area: Graph transformations

What goes wrong: Multiple transformations and f(x+k) direction are commonly mishandled.

Repair routine: Transform key points and check global shape/domain/end behaviour.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER23, ER25, ER26

06. Misusing supplied formulae

Area: Trigonometry

What goes wrong: Candidates invent false identities or ignore the formula list.

Repair routine: Identify the exact listed identity first, substitute symbolically, then simplify.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER25, ER26

07. Guessing factors / inconsistent division

Area: Polynomial algebra

What goes wrong: Rote or inconsistent factorisation loses method credit.

Repair routine: Use factor theorem/synthetic or polynomial division in a standard layout and state the conclusion.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER22, ER23, ER25, ER26

08. Wrong condition or missing inequality

Area: Discriminant

What goes wrong: Nature-of-roots problems require the correct >0/=0/<0 condition and a solved inequality.

Repair routine: Write the condition in words and symbols before substituting.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER22, ER24, ER25, ER26

09. Confusing components, magnitudes and scalar product

Area: Vectors

What goes wrong: Operations on vectors are written as if they were ordinary scalars.

Repair routine: Label vector, magnitude and dot product separately; calculate each object using its own definition.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER25, ER26

10. Finding x but not y/nature/endpoints

Area: Stationary points

What goes wrong: A partial stationary-point solution is not a full graph/optimisation conclusion.

Repair routine: For each candidate x: calculate y, classify, then check endpoints if interval is closed.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER23, ER26

11. Finding irrelevant centre/radius only

Area: Circle geometry

What goes wrong: The question may require intersection/tangency reasoning rather than circle identification.

Repair routine: Write the requested target before algebra; use tangent ⊥ radius and solve the actual simultaneous system.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER22, ER24, ER25, ER26

12. Missing inner derivative

Area: Chain rule

What goes wrong: Candidates recognise the outer derivative but do not complete the chain rule.

Repair routine: Write outer derivative × derivative of inner expression explicitly.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER22, ER24, ER25

13. Switching to degrees in calculus

Area: Radian measure

What goes wrong: Trig differentiation/integration formulas assume radians.

Repair routine: Keep radians throughout calculus unless the question explicitly requires degrees at the end.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER22, ER26

14. Missing brackets or inefficient substitution

Area: Definite integrals

What goes wrong: Sign errors appear when substituting negative limits; calculator use becomes opaque.

Repair routine: Write F(b)-F(a) with full brackets; use calculator only after the antiderivative is correct.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER22, ER24, ER26

15. Treating signed integral as geometric area

Area: Area by integration

What goes wrong: Area below x-axis must contribute positively to total area.

Repair routine: Sketch sign regions; split integrals where needed and take geometric area.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER22, ER24, ER26

16. Solving an equation but not the inequality

Area: Quadratic inequalities

What goes wrong: Roots alone do not identify the required intervals.

Repair routine: Find roots, sketch/sign-test, then state interval(s) with correct inequality symbols.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER22, ER25

17. Conflicting y-expressions / invalid rearrangement

Area: Inverse functions

What goes wrong: Poor algebra makes the inverse logically inconsistent.

Repair routine: Set y=f(x), rearrange uniquely for x, swap variables once, then check by composition.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER22, ER23, ER24, ER26

18. Using wrong linearisation for y=ax^b vs y=ab^x

Area: Straight-line models

What goes wrong: Different log models produce different gradient/intercept meanings.

Repair routine: Derive the transformed equation before interpreting slope/intercept.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER22, ER24, ER26

19. Missing solutions in interval

Area: Trigonometric equations

What goes wrong: One inverse-trig value is not the full solution set.

Repair routine: Use graph/quadrant/period reasoning and test every candidate against the stated interval.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER22, ER26

20. Processing amplitude/phase/period incorrectly

Area: Wave function

What goes wrong: Correct form may still be followed by wrong interpretation.

Repair routine: Record amplitude, phase shift, period and range separately before solving/graphing.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER24, ER26

21. Using vague statements such as “parallel points”

Area: Collinearity

What goes wrong: The condition must be communicated coherently using vector multiples/path relationships.

Repair routine: State that relevant displacement vectors are scalar multiples and connect this to collinearity.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER26

22. Giving a value without explaining existence

Area: Recurrence limits

What goes wrong: A limit may not exist; algebra alone is insufficient.

Repair routine: Solve L=f(L) only after considering convergence/behaviour; state why the limit is valid or invalid.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER26

23. Not stating derivative inequality

Area: Increasing/decreasing

What goes wrong: The condition f'(x)>0 or <0 is part of the reasoning.

Repair routine: Write the derivative inequality before solving.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER23, ER26

24. Weak exact trig / surd processing

Area: Exact values

What goes wrong: Non-calculator work depends on exact values and simplification.

Repair routine: Memorise National 5 exact values, practise radians, simplify surds/fractions exactly.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER23, ER24, ER26

25. Overworking or premature approximation

Area: Calculator use

What goes wrong: Paper 2 errors arise from inefficient entry, rounding and transcription.

Repair routine: Keep exact expressions until final evaluation; use memory/brackets and record enough working to audit.

Rapid retest: Complete one short isolated example, then one unfamiliar multi-step question. Do not mark the skill secure until both are correct with logically consistent working.

Evidence: ER22, ER24, ER25, ER26

Diagnostic log

Date	Error type	Trigger	Repair completed	Retest result

References and source notes

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