



LC HL MATHS

FOUNDATION PROGRAM

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1 Overview of 8-week Foundations of LC HL Maths Program

The LC HL Maths Foundations Program is an intensive 8-week course designed to help you start thinking like a mathematician. The key to this is easy: **Metacognition is the engine of mastery**. **Metacognition** is thinking about *how you think*.

We reject passive learning. Every resource—every worksheet, every question, every minute of instruction—is designed to force you into the role of the **active engineer of their own understanding**. This program integrates methods from cognitive science (e.g., retrieval practice, spaced repetition, interleaving, dual coding) in engaging ways to cover most of the LC HL Maths curriculum. This system doesn't just teach maths; it builds the cognitive frameworks necessary to learn anything deeply and permanently. Mastering these study skills will **accelerate your learning** like you would never believe.

Here is the timetable for this 8-week program. There are links to extra questions and resources on StudyClix, should you wish to use them.

Links	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
Topic 1	Indices and Logs	Functions	Differentiation - Rules	Differentiation - Applications	Co-Ordinate Geometry of the Line	Trigonometry - Functions & Identities	Statistics - Z Scores	Differentiation - Applications
Topic 2	Induction	Sequences & Series	Financial Maths	Integration	Co-Ordinate Geometry of the Circle	Trigonometry - Triangles	Probability	Statistics - Inferential Stats

The program is structured in two 4-week blocks, designed to install a foundational “language system” for maths.

- **Block 1 (Weeks 1-4): How Numbers Work.** Establish the language, tools, and fundamental laws that govern mathematics.
- **Block 2 (Weeks 5-8): How To Use Numbers.** Apply these core principles to more complex topics like trigonometry and statistics.
- **Interleaved Revision:** From Week 2 onwards, every assessment and subsequent worksheet intentionally integrates concepts from previous weeks. This is not incidental; it is a deliberate design feature to combat the forgetting curve and build interconnected, flexible knowledge.

2 Sample Study Plan

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Review Key Terms & LO's. Watch video (30 mins)	Start Ex. Worksheet (60 mins)	Finish Ex. Work Sheet, Correct Work sheet. (75 mins)	Online Lesson (60 mins)	Error Analysis Exercise (40 mins)	Exam Q Assessment (60 mins)	Self-Correct & Prep Day (30 mins)

3 Weekly Study Resources

1. **Key Terms:** Key vocabulary, definitions and formulae required for the worksheets (i.e., a cheat sheet/quick guide to this topic).
2. **Learning Objectives & Indicative Content (aligned LC HL Maths curriculum & specification):** Clear, quantifiable, achievable **goals** for the coming week.
3. **Exercise Worksheet:** Your main learning tool. It contains clear notes, worked examples, and key questions to solidify your understanding. This can be used for 1-4 study sessions in a given week (takes 90-120 minutes to complete).
4. ***Students have an online lesson after the exercise worksheet is completed***
5. **Error-Based Analysis Exercise:** A unique exercise where you'll find and fix common mistakes, training yourself to think like an examiner.
6. **Exam Question Assessment:** A short exam-style test to check your progress and get comfortable with the format of the real thing.
7. **Self-Correction & Progress Tracking Protocol:** see below.

4 Self-Correction & Progress Tracking Protocol

(This is the **MOST IMPORTANT task of the week** – complete this on Sunday, then immediately plan the following week's study to **guarantee consistency**).

1. **Mark your work.** Use a different colour pen.
2. **For each question, categorise your result:**
 - **Fluent:** I got it right and knew why.
 - **Lucky:** I got it right but was guessing/doubtful. I could not fully explain why this is the answer/how I got it.
 - **Error:** I got it wrong.
3. **For each Error, complete this sentence:**

"The root cause of this was: I _____."
(e.g., "I confused the formula for displacement with distance," or "I forgot to convert units.")
4. **For each Lucky answer, mark with a highlighter for later revision tests.**
5. **Action Plan:** Based on your analysis, what is **one specific thing** you will do before next week's lesson? (e.g., "Create a flashcards for function properties," "Redo the error-analysis exercise," "Watch a video on integration steps").
6. **Confidence Rating:** On a scale of 1-5, how confident do you now feel with this week's core concepts? (1 = Not at all, 5 = Rock Solid). Go through every Learning Objective and rank them. Continue this at the end of every week.

5 Why This System Works

- **Smarter Learning, Not More Learning:** My materials are designed using proven learning science to help you understand and retain information more effectively.
- **Build Confidence Through Mastery:** Start with the absolute essentials, ensuring you have a rock-solid foundation before moving on. No gaps, no confusion. Ask as many questions as you can.
- **You Learn How to Learn:** This program will teach you how to review your work, spot your own mistakes, and identify what you need to focus on. This is a skill that helps you in every walk of life.
- **Focus on Weaknesses:** By directing most of your time to analysing mistakes and revising difficult topics, you are forcing your brain to grow rapidly.

6 Weekly Learning Objectives

Week 1: Algebra 101

- **1.1:** Factorise quadratic and cubic expressions and solve their corresponding equations.
- **1.2:** Solve rational equations and linear and quadratic inequalities, expressing solutions on a number line.
- **1.3:** Apply the Factor and Remainder Theorems to factorise polynomials and find remainders.
- **1.4:** Understand and apply the principles of proof by contradiction.

Week 2: Functions & Graphs, Sequences & Series

- **2.1:** Analyse and sketch polynomial and exponential functions, identifying domain, range, and key features.
- **2.2:** Define, expand, and find the general term of Arithmetic and Geometric Progressions.
- **2.3:** Calculate the sum of a given number of terms of an AP and a GP, including the sum to infinity for a GP.
- **2.4:** Apply knowledge of sequences to solve financial maths problems involving loans, savings, and investments.

Week 3: Basic Calculus

- **3.1:** Define the derivative from first principles and apply differentiation rules to polynomials.
- **3.2:** Differentiate trigonometric, exponential, and logarithmic functions.
- **3.3:** Use differentiation to find slopes, equations of tangents/normals, and to identify maxima, minima, and points of inflection.
- **3.4:** Define integration as the inverse of differentiation and integrate polynomial, trigonometric, and exponential functions.

Week 4: Advanced Calculus

- **4.1:** Apply differentiation to rates of change and optimisation problems.
- **4.2:** Calculate the area under a curve and the area between two curves using definite integration.
- **4.3:** Apply integration to solve problems in kinematics and other real-world contexts.
- **4.4:** Understand and apply the Mean Value Theorem for integrals.

****Students will have a "Reading Week" between Weeks 4 and 5.****

Week 5: Coordinate Geometry

- **5.1:** Find equations of lines (slope-intercept, point-slope) and circles (centre-radius form).
- **5.2:** Solve problems involving parallel and perpendicular lines, and the perpendicular distance from a point to a line.
- **5.3:** Find the equation of a tangent to a circle at a given point.
- **5.4:** Determine the relationship between two circles (touching externally/internally, intersecting).

Week 6: Trigonometry

- **6.1:** Apply trigonometric ratios (sin, cos, tan) to solve problems involving right-angled triangles.
- **6.2:** Use formulae like the Sine and Cosine Rules to find unknown sides, angles and the area of a triangle in non-right triangles.
- **6.3:** Prove and manipulate key trigonometric identities.
- **6.4:** Solve complex trigonometric equations for a general solution.

Week 7: Probability & Statistics

- **7.1:** Calculate conditional probabilities using tree diagrams and two-way tables and differentiate between independent and mutually exclusive events.
- **7.2:** Calculate and interpret measures of central tendency (mean, median, mode) and spread (standard deviation, interquartile range).
- **7.3:** Calculate probabilities using Normal Distribution and standard z-scores.
- **7.4:** Construct and interpret confidence intervals for a population mean.
- **7.5:** Perform a full hypothesis test for a population mean (one-sample z-test), stating hypotheses, test statistic, p-value, and conclusion in context.

Week 8: Exam Strategies

- **8.1:** Solve complex problems by integrating knowledge from algebra, functions, and calculus.
- **8.2:** Solve complex problems by integrating knowledge from geometry, trigonometry, and statistics.
- **8.3:** Apply effective exam strategies to past paper questions under timed conditions.