



Articulated Course in Mathematics

SPECIAL ISSUE

Reading Guide

WHERE TO BEGIN, AND HOW TO CONTINUE

William de France

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Collection ARTICULATED COURSE IN MATHEMATICS

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WHERE SHOULD I BEGIN?

The *Articulated Course in Mathematics* spans five volumes and more than 5,600 pages, from high school to research. You do not enter it at random: this guide gives the door according to where you come from, and the path according to where you are going.

It reads in a few minutes. The first part gives your point of entry; the second, the map of the volumes — what each assumes, what it builds; the third, three tracks that cross the collection without reading everything; the last, reading plans over twelve, twenty-four and fifty-two weeks.

One rule orients everything else. Volumes I through III follow one another and form a continuous progression, from high school to graduate level. Beyond that the paths part: Volume IV (*Correspondences*) and Volume V (*Mathematical Physics*) both assume Volume III, but are independent of each other.

YOUR POINT OF ENTRY

Seven readers, seven doors. Find yours.

YOU ARE READING OUT OF CURIOSITY, WITH NO PLAN TO WORK THROUGH A COURSE

Start with the essay *The Apocalypse According to Galois*: the story, with no prerequisites, of what the course proves. The Reading room then lets you leaf through an excerpt of all five volumes, online, without downloading anything.

YOU ARE DISCOVERING MATHEMATICS BEYOND HIGH SCHOOL

Start with Volume I, *Elements* — it begins with number and builds everything else. The essay *The Apocalypse According to Galois* can come first: it is the story, with no prerequisites, of what the course proves.

YOU STUDIED ONCE, BUT HIGH SCHOOL IS FAR BEHIND

Enter through Volume II: its first part, “Learning to Read Mathematics,” re-teaches in six chapters how to read a statement, a definition, a proof. Keep Volume I as a reference for any missing foundations.

YOU ARE A MATHEMATICS UNDERGRADUATE

Volume II, *Undergraduate*, is your working volume — the longest in the collection, the one where proof itself becomes the object of study.

YOU ARE PREPARING A MASTER'S DEGREE OR THE AGRÉGATION

Volume III, *Graduate*, runs from functional analysis to Galois theory and algebraic geometry. The chapters of Volume II reread as refreshers.

YOU WANT TO UNDERSTAND THE LANGLANDS PROGRAM

Volume IV, *Correspondences*, is the destination; it assumes from Volume III Galois theory, some commutative algebra, and complex analysis.

YOU COME FROM PHYSICS

Volume V, *Mathematical Physics*, reads after the functional analysis and Lie groups of Volume III; it is independent of Volume IV.

THE MAP OF THE VOLUMES

Each volume is described by what it assumes and by what it builds.
That is the only map you need.

I. Elements

From Number to Form

HIGH SCHOOL — 160 articles · 671 pages

ASSUMES: middle-school mathematics.

BUILDS: computation, proof, geometry, complex numbers, functions, probability — the chain $\mathbb{N} \subset \mathbb{Z} \subset \mathbb{Q} \subset \mathbb{R} \subset \mathbb{C}$.

II. Undergraduate

From Statement to Space

UNDERGRADUATE — 288 articles · 1,364 pages

ASSUMES: Volume I, or solid high-school mathematics.

BUILDS: how to read statements, real analysis, linear algebra, groups, measure theory, first steps into complex and functional analysis.

III. Graduate

From Functional Analysis to Galois Theory

MASTER, AGRÉGATION — 484 articles · 2,465 pages

ASSUMES: Volume II.

BUILDS: functional analysis, distributions, Galois theory, algebraic geometry, manifolds, Lie groups — the structures.

IV. Correspondences

From Class Field Theory to the Langlands Program

DOCTORAL, RESEARCH — 162 articles · 455 pages

ASSUMES: from Volume III: Galois theory, commutative algebra, complex analysis.

BUILDS: number fields, class field theory, modular forms, Galois representations, up to the Langlands program.

V. Mathematical Physics

From Symmetries to Strings

DOCTORAL, RESEARCH — 220 articles · 692 pages

ASSUMES: from Volume III: functional analysis, manifolds, Lie groups — independent of Volume IV.

BUILDS: mechanics, quantum theory, gauge theories, fields, relativity, strings.

Volumes I through III follow one another. Beyond that the paths part: Volume IV and Volume V both assume Volume III, but are independent of each other.

THREE TRACKS

No one is required to read everything. Each track crosses the volumes keeping only the parts that serve it.

The algebra and arithmetic track

I (arithmetic, quadratics, complex numbers) $\rightarrow$ II (polynomials and groups, linear algebra, arithmetic) $\rightarrow$ III (general algebra, Galois theory, commutative algebra, algebraic geometry) $\rightarrow$ all of IV.

The analysis track

I (functions, sequences, the integral) $\rightarrow$ II (real analysis, series, measure and integration, complex analysis) $\rightarrow$ III (functional analysis, distributions and Fourier, differential equations, dynamical systems) $\rightarrow$ V for analysis put to work.

The mathematical physics track

I $\rightarrow$ II (linear algebra, multivariable calculus, probability) $\rightarrow$ III (functional analysis, manifolds, Lie groups, Riemannian geometry) $\rightarrow$ V (from symmetries to strings).

READING PLANS

Three horizons, depending on the time you have.

Twelve weeks

One volume, thoroughly: all of Volume I (671 pages, about 56 a week), or a chosen part of a later volume.

Twenty-four weeks

A full track to graduate level: your track's chapters across Volumes I–III, about 60 pages a week.

One year

The whole course, 5,600 pages — a serious commitment, about 110 pages a week. Realistic for a sabbatical year or a reading pair.

JUDGE FOR YOURSELF

Every volume can be browsed freely before any purchase. The Reading room presents online a continuous excerpt of all five volumes, with table of contents and search, no sign-up required; each page of the bookshop also offers a PDF sample to download. Judge for yourself before choosing your door.

THE BOOKSHOP: clementinium.com

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La Lettre, the house letter, quarterly, announces new titles and corrected editions — every reported error is a corrected error, and every buyer receives for life the latest edition of their volumes.

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Clementinium Editions

The symbol on the cover is the first letter of the Hebrew alphabet, the aleph. In mathematics, it denotes Cantor's transfinite cardinals. In literature, it is the point in Borges where the entire universe concentrates in a single place. Its name, in the Semitic languages, means "head of an ox." The reader who might see in that head the echo of a horned goddess carrying the sun between her two horizons would not be entirely wrong.