### Progress Toward Completion of the Mathematics Major

**Computer Science Concentration**

*Arts and Sciences students may be admitted to the math major after successfully completing a semester of multivariable calculus, a semester of linear algebra, and a 3- or 4-credit computer programming course. To apply, visit math.cornell.edu/major.*

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<tr>
<th>Student's Name</th>
<th>Net ID</th>
<th>Faculty Advisor</th>
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#### Courses needed to complete the major

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**Initials**

**Date**

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Math majors must complete **9 courses** for the major, as described in items 1–3 below, with a **minimum grade of C–**. No course may be used to satisfy more than one requirement. MATH courses numbered between 4980 and 5999 do not count.

_____ At least two of the MATH courses taken must be at the 4000 level (or above).

#### 1. Two Courses in Algebra.

( ____ transfer credit applied, see reverse)

- ____ MATH 3320 - Introduction to Number Theory
- ____ MATH 3340 - Abstract Algebra*
- ____ MATH 3360 - Applicable Algebra*
- ____ MATH 4310 - Linear Algebra*
- ____ MATH 4330 - Honors Linear Algebra*
- ____ MATH 4340 - Honors Introduction to Algebra*
- ____ MATH 4370 - Computational Algebra
- ____ MATH 4500 - Matrix Groups
- ____ MATH 4560 - Geometry of Discrete Groups

**Discontinued:** ____ MATH 4315*

#### 2. Two Courses in Analysis.

( ____ transfer credit applied, see reverse)

- ____ MATH 3110 - Introduction to Analysis*
- ____ MATH 3210 - Manifolds & Differential Forms
- ____ MATH 3270 - Introduction to Ordinary Differential Equations*
- ____ MATH 4130 - Honors Intro Analysis I*
- ____ MATH 4140 - Honors Intro Analysis II
- ____ MATH 4180 - Complex Analysis*
- ____ MATH 4200 - Differential Equations and Dynamical Systems*
- ____ MATH 4210 - Nonlinear Dynamics and Chaos*
- ____ MATH 4220 - Applied Complex Analysis*
- ____ MATH 4250 - Numerical Analysis and Differential Equations [also CS 4210]
- ____ MATH 4260 - Numerical Analysis: Linear & Nonlinear Problems [also CS 4220]
- ____ MATH 4280 - Introduction to Partial Differential Equations*

*See course descriptions at math.cornell.edu/upper-level-courses for information on **forbidden overlaps**.
3. Concentration in Computer Science. (___ transfer credit applied, see below)

Five courses from (v) and (vi) below.

(v) At least one MATH course numbered 3000 or above:

____________________________________________________________________________________

____________________________________________________________________________________

(vi) At least three CS courses with significant mathematical content.

____ CS 3220 - Computational Mathematics for Computer Science
____ CS 4110 - Programming Languages and Logics
____ CS 4160 - Formal Verification
____ CS 4210 - Numerical Analysis and Differential Equations [also MATH 4250]
____ CS 4220 - Numerical Analysis: Linear and Nonlinear Problems [also MATH 4260]
____ CS 4620 - Introduction to Computer Graphics
____ CS 4670 - Introduction to Computer Vision
____ CS 4700 - Foundations of Artificial Intelligence
____ CS 4740 - Natural Language Processing [also COGST 4740, LING 4474]
____ CS 4744 - Computational Linguistics I [also COGST 4240, LING 4424]
____ CS 4775 - Computational Genetics and Genomics [also BTRY 4840]
____ CS 4780 - Introduction to Machine Learning
____ CS 4783 – Mathematical Foundations of Machine Learning
____ CS 4786 - Machine Learning for Data Science
____ CS 4787 - Principles of Large-Scale Machine Learning Systems
____ CS 4789 - Introduction to Reinforcement Learning
____ CS 4810 - Introduction to Theory of Computing
____ CS 4812 - Quantum Information Processing [also PHYS 4481]
____ CS 4814 - Introduction to Computational Complexity
____ CS 4820 - Introduction to Analysis of Algorithms
____ CS 4830 - Introduction to Cryptography
____ CS 4850 - Mathematical Foundations for the Information Age
____ CS 4852 - Networks II: Market Design [also ECON 3825, INFO 4220]
____ CS 4860 - Applied Logic [also MATH 4860]

(____ approved by faculty advisor)

Note: There are also many CS graduate courses with significant mathematical content that may be used. Interested students should discuss these options with their math faculty advisor (after being admitted to the math major.)

Transfer Credit / Study Abroad Courses Applied to the Major

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<th>Course Number &amp;Title</th>
<th>Institution</th>
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