Reed College Mathematics and Statistics:
A guide for new students and their advisers

(Beyond reading this document, incoming students interested in taking mathematics or statistics courses should attend one of the mathematics and statistics department open hours during Orientation Week.)

Reed students who enter the college with three years of high school mathematics can take a number of mathematics, statistics, and computer science courses. This document is meant to help them and their advisers navigate their choices and self select into an engaging course appropriate for their background. The course content descriptions here should be referenced in parallel with Reed's course catalog descriptions at https://www.reed.edu/math/courses.html. Of course the mathematics and statistics department is happy to assist if students or advisers have questions.

Math 111: Calculus. Math 111 covers both differential and integral calculus of one variable. It can be appropriate for students with or without prior calculus coursework in high school, but students who enter Reed with background and credit in calculus as described at https://www.reed.edu/math/placement.html may skip this course and receive 1.0 unit of Reed credit. Students who don't have the specified AP or IB or A-levels or college credit but who have significant calculus preparation should contact Zajj Daughertyzdaugherty@reed.edu or Angélica Osornoaosorno@reed.edu or Marcus Robinson mrobinso@reed.edu or Jerry Shurman jerry@reed.edu to discuss placement.

In some years, one or two sections of Math 111 are taught in a variant way, sometimes to serve students who have already taken calculus in high school but want to see a different treatment of the subject, sometimes to serve students who have had difficulty in past attempts at calculus, sometimes with emphasis on how calculus bears on the life sciences. The mathematics and statistics department will share this information at the August faculty meeting, and we are happy to discuss our variant sections with anybody who has questions about them.

Math 112: Introduction to Analysis. This course introduces the real and complex number system properties that form the foundational underpinnings of calculus; it also serves as a first introduction to rigorous mathematical reasoning and argument. Math 112 has Math 111 or equivalent as a prerequisite, and it underlies the subject matter of Math 201: Linear Algebra and Math 202: Vector Calculus. Placement out of Math 112 is much rarer than placement out of Math 111, usually requiring prior college level mathematics coursework that involves significant experience writing proofs and some analysis. Students who believe they can place out of

Math 112 should see https://www.reed.edu/math/placement.html and then contact Zajj Daughertyzdaugherty@reed.edu or Angélica Osornoaosorno@reed.edu or Marcus Robinson mrobinso@reed.edu or Jerry Shurman jerry@reed.edu to discuss their situation.

Math 113: Discrete Structures. Math 113 is independent of Math 111 and Math 112, its higher course number notwithstanding, and it has no college prerequisites. This course focuses on problem solving methods in combinatorics (advanced counting), number theory (properties of the integers, i.e., the whole numbers), and probability (mathematical likelihood). Students looking for a non-calculus based introduction to college level mathematics are welcome in this course; it is also required for math and computer science majors. Students intending to major in Mathematics, Mathematics with a Concentration in Statistics, Computer Science/Mathematics, or Computer Science are advised to *take Math 113 before the spring semester of their sophomore year*. In particular, the Computer Science qualifying exam, also required for the Computer Science/Mathematics major, takes place in the second semester of the sophomore year and includes material from Math 113.

Math 141: Introduction to Probability and Statistics. This course provides a deep introduction to how data are used to reason about the world. It requires no previous experience with statistics, calculus, or computer science but even students who have received a 4 or 5 on the AP statistics exam find it useful (and AP credit in Statistics is not a substitute for Math 141). The course covers the elementary tools of data science and descriptive analysis as well as the statistical models starting with classical inference and extending to generalized linear models. Underpinning all of the work is the language of probability and the tools of computation, namely the R programming language.

Math 201: Linear Algebra. This is a proof based course in linear algebra. It introduces abstract vector spaces over arbitrary fields. Topics include linear transformations, determinants, eigenvalues, eigenvectors, diagonalization. Geometry of inner product spaces is examined in the setting of real and complex fields. The course has Math 112 as a prerequisite and thus assumes that its students enter with strong proof writing skills.

To reiterate, a student with three years of high school mathematics may take Math 111: Calculus, Math 113: Discrete Structures, or Math 141: Introduction to Probability and Statistics; Math 111 or equivalent is required for Math 112: Analysis, which in turn is required for Math 201: Linear Algebra, and both Math 112 and Math 201 are required for Math 202: Vector Calculus.

First year schedule for Mathematics majors

The typical schedule for a first year student who is interested in some version of the mathematics major takes one of two forms, depending on initial placement into either Math 111 or Math 112:

Fall	**Spring**
Hum 110	Hum 110
Math 111	Math 112
X	X

or

Fall	**Spring**
Hum 110	Hum 110
Math 112	Math 201
X	X

Here are some things to take into account when choosing the third course in each semester (marked with X, above):

- It is not necessary to take Math 113 during the first year, but it should be taken sometime during the first three semesters.
- Students who may pursue the Mathematics with a Concentration in Statistics major should consider taking Math 141 during the first year, but it is also fine to wait until the sophomore year. This course is often over enrolled. So for students intending to take Math 141, it would be a good idea to select Math 141 as a preferred course (in the initial round of online class registration).
- Students who are considering a major in a natural science should take the introductory courses in that science during the first year.
- Some students decide to enroll in a fourth course for the spring semester. These students are then taking 4.5 units of courses in the spring, a demanding schedule. Such students should reconsider their spring schedules after completing the fall semester; there is an opportunity to revise schedules during winter break. It is also possible to drop a fourth course during the first month of the spring semester.

First year schedule for Computer Science/Mathematics majors

Students intending to pursue the CS-Math interdisciplinary major should take the following courses during their first year:

- Hum 110

- Two of Math 111/112/113.
- One of CS 121/122/221. Placement is determined by the CS placement exam (consult with Adam Groce agroce@reed.edu).

Some CS/Math students follow CS 121/122 with CS 221 or take three math courses during the first year. In general, it is better to err on the side of taking more math rather than more CS during the first year.