

Math 110ABC: Algebra

Catalog Descriptions

110A-110B. Algebra. Lecture, three hours; discussion, one hour. Prerequisite: course 115A. 110A. Not open for credit to students with credit for course 117. Ring of integers, integral domains, fields, polynomial domains, unique factorization. 110B. Groups, structure of finite groups.

110C. Algebra. Lecture, three hours; discussion, one hour. Prerequisite: courses 110A-110B. Field extensions, Galois theory, applications to geometric constructions, solvability by radicals.

General Information

Math 110ABC is the basic undergraduate course sequence in abstract algebra. Math 110A covers rings and fields, while Math 110B treats group theory.

An honors course sequence 110AH-110BH runs parallel to 110A-110B, however the order of topics is juxtaposed. Math 110AH is devoted to the study of group theory. Groups are a mathematical expression of symmetry and are vitally important in many areas of Mathematics, e.g. Number Theory, Topology and Geometry. Group theory plays an important role in Physics, especially in Quantum Theory. The course will cover the definition and properties of groups as well as the structure of finite groups. The honors sequence in Algebra is essential for those interested in pursuing pure mathematics at any higher level as well as being one of the most interesting and challenging mathematics courses at UCLA. Math 110AH covers group theory in the Fall, while Math 110BH in the Winter covers rings and fields. Math 110BH is devoted to Ring Theory, especially commutative rings. Rings play a central role in many areas of mathematics, e.g. Algebra, Algebraic Geometry and Number Theory. The highlight of the course is the theory of modules over Principal Ideal Domains with applications to the theory of canonical forms in linear algebra and to the structure of finitely generated abelian groups. Thus a student who has a difficult time surviving group theory in Math 110AH in the Fall can continue in Math 110B in the Winter and learn group theory really well. In the reverse direction, no student has ever taken 110A in the Fall and switched to 110BH in the Winter, though there always could be a first. The prerequisite for 110BH is 110AH or consent of instructor.

Students who take 110AH but not 110BH can take 110A or 117.

Math 110C, offered in the Spring, is designed for students completing either the 110A-110B or the 110AH-110BH sequence. Math 110C covers Galois theory. This is the theory initiated by Evariste Galois (killed in a duel at age 21), which laid an abstract foundation for proving the theorem of N. Abel (died of consumption at age 27) that the general quintic equation is not solvable by radicals.