Math 110
Mathematical Explorations

Advising

This core course, together with its sister course Math 111 - Mathematical Applications, is a **mathematics for liberal arts course**. These courses are designed to enable students to develop a broader understanding of mathematics and more positive appreciation of mathematics - one that is not dominated by an ability simply to perform rote procedures.

Math 110 and Math 111 are appropriate for all students. In fact, these courses should be considered the default recommendation for all students who do not: i) require specific mathematics courses for their major, or ii) express a specific interest in another mathematics course for specific programmatic reasons.

Students may take both Math 110 and Math 111 for credit and to satisfy core requirements. **Math 110 and Math 111 can be taken in either order or even simultaneously.**

Math 110 is **not** a remedial, basic skills, nor mathematical literacy course. Students are expected to bring an appropriate level of mathematical preparation to the course.

Catalog Description

An introductory course designed to provide the liberal arts major with an opportunity to develop a broader appreciation of mathematics by exploring ways in which the artistic, aesthetic, intellectual, and humanistic aspects of mathematics are as important as its utility. Topics may include: mathematical reasoning, the infinite, topology, chaos and fractals, symmetry, elementary number theory, modern geometry, and the history of mathematics. Prerequisite: High School Algebra II or MATH 0103.

Objectives & Requirements

Most college preparatory mathematics courses focus on acquiring new mathematical tools, skills, and techniques. In contrast, the focus of this course is on new mathematical objects, perspectives, ideas, and connections to other areas using tools that the students have already learned. This enables students to develop a **broader understanding of mathematics** and more **positive appreciation of mathematics** - one that is not dominated by an ability simply to perform rote procedures.

Math 110 is **not** a remedial, basic skills, nor mathematical literacy course. While it is appropriate to address some basic skills and literacy issues - one must do this in virtually any course - it is not appropriate for this to become a significant focus of the course. Some basic skills and literacy issues may be addressed in the additional class meeting time of Accuplacer sections of this course.

The content of Math 110 and Math 111 must be kept as disjoint as possible as they are sister courses that many students will take together to fulfill their core requirement in mathematics. Math 111 satisfies the "Applied Mathematics" sub-area of the mathematics core and is expected to cover "applied" topics. In contrast, Math 110 satisfies the "Traditional Mathematics" sub-area and is meant to cover topics that are not generally considered "applied mathematics".

Possible Topics: Possible topics for Math 110 may include: mathematical reasoning, patterns, the infinite, number theory, set theory, topology, chaos and fractals, the history of mathematics, mathematics and the arts (e.g. mathematics in painting, sculpture, architecture, music, perspective drawing), symmetry (e.g. kaleidescopes, the wallpaper groups, tessellations, Friesze patterns), and modern geometry (e.g. non-Euclidean geometries, taxi-cab geometry, the higher dimensions).

Topics to Avoid: Topics that should, generally, be left to Math 111 include: linear programming, voting theory, apportionment, interpretive statistics, descriptive statistics, game theory, fair division, graph theory, networks and scheduling, mathematical modeling, population growth, coding and cryptography, orienteering, and financial mathematics.

Appropriate Texts: Appropriate texts that have been used in Math 110 include:
The Heart of Mathematics, by Berger and Starbird, Key Curriculum Press ISBN: 1-931914-51-6.
Mathematics: A Human Endeavor, 3rd edition, by Harold Jacobs, W.H. Freeman ISBN: 071-672-426X. [The chapters "Functions and Their Graphs", "Large Numbers and Logarithms", and "Mathematical Curves" are not appropriate for either Math 110 or Math 111. The chapters "Mathematical Ways of Thinking", "Number Sequences", "Symmetry and Regular Figures", and "Topics in Topology" are more appropriate for Math 110. The remaining chapters, "Methods of Counting", "Mathematics of Chance", and "An Introduction to Statistics", are more appropriate for Math 111.]
Discovering the Art of Number Theory: A Topical Guide, by Julian Fleron.
Excursions in Modern Mathematics, by P. Tannenbaum and R. Arnold, Prentice Hall. [Part III, "Growth and Symmetry" is more appropriate for Math 110 while the remaining parts, "The Mathematics of Social Choice", "Management Science", and "Statistics" are more appropriate for Math 111.]

Core Status

Math 110 is a core mathematics course satisfying the "Traditional Mathematics" sub-area. It satisfies these areas in the following ways (from the 1997 Core Inclusion Form):

COURSE OBJECTIVES

Specify how the proposed course would enable students to accomplish **one or more** of the following objectives:

1. Recognize, understand, utilize, integrate and communicate mathematical concepts, mathematical methods and logical reasoning.

This course will introduce students to selected mathematical topics. These topics will be explored in detail by the students, with a focus on the artistic, aesthetic, intellectual and humanistic aspects of the subject. This exploration will include the development of conceptual understanding of the area, its fundamental ideas, its overall structure, the context and/or history of its development, its role in mathematics, and its role in organized knowledge. During the course of this exploration students are expected to communicate their difficulties, progress, and conclusions both verbally and in writing in a coherent fashion using valid mathematical reasoning, methodology, and appropriate mathematical language.

2. Apply mathematical concepts, mathematical methods, and mathematical reasoning within an analytic framework.

As detailed above, student exploration will focus on the artistic, aesthetic, intellectual and humanistic aspects of selected topics in mathematics. As such, this exploration will consider how mathematical concepts, methods and reasoning have contributed to humankind's intellectual development; have impacted the human aspects of the development of mathematics; and have contributed to the development of the aesthetic.

CORE Course Proposal Form for MATHEMATICS/APPLIED ANALYTICAL REASONING (p. 3)
(Use appropriate category.)

COURSE REQUIREMENTS (TRADITIONAL MATHEMATICS)

For courses proposed for the Traditional Mathematics sub-area, specify how the course would meet **both** of the following requirements:

1. Introduce traditional mathematical concepts, constructs, systems, algorithms, and methods of inquiry and analysis.

This course will introduce students to selected mathematical topics. These topics will be explored in detail by the students, with a focus on the artistic, aesthetic, intellectual and humanistic aspects of the subject. In the course of this exploration the students will utilize problem solving skills and mathematical reasoning; they will make and test conjectures; they will develop algorithms and analyze similar problems, examples and objects; they will explore related mathematical ideas and concepts; they will consider the role of mathematical ideas, mathematical reasoning, and mathematical results in the human experience.

2. Provide an environment where students can construct, investigate, learn, and/or apply those attributes described in Course Requirement 1.

The goal of this course is to provide a supportive environment where students can explore the artistic, aesthetic, intellectual and humanistic aspects of selected mathematical topics. Although a variety of learning strategies may be employed: lecture and discussion, seminar, cooperative learning, guided discovery learning, or student projects and presentations, their focus will be on enabling students to develop a broader appreciation of mathematics through their own exploration.