

# MATH@TICS

“All the  $\nu$ 's fit to print”

Department of Mathematics | Ithaca College

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## $\nu_0$ : From the Desk of the Chair

We are more than halfway through the spring semester and the weather is warming and that means it's time to think about fall courses. For your convenience we have compiled our fall 2022 course in one place plus an interesting problem from our problem guru Dave Brown and some math in the news.

A big thanks is due to Megan Martinez for organizing our High School Math Exploration Day, as well

as thanks to our math majors that helped out during the event. We had 133 students compete on 36 teams representing 12 schools. Some of the teachers mentioned that this was the first field trip for their students in three years. It was a big deal to them and it was great to see so much activity in Emerson. Lots of math and a good time was had by all.

*Tom Pfaff, chair*

## $\nu_1$ : Fall Courses

Registration for Fall 2022 courses is almost here! The descriptions below are for courses offered this coming fall that you might be interested in.

### **15900 Introduction to R (1 cr.)**

**Prof. Brown**

R is a scientific programming language used in many companies to analyze data to help make decisions. This course is an introduction to using R and does not require any previous programming experience.

### **18700 Applied Linear Algebra (3 cr.)**

**Prof. Visscher**

Linear algebra is a foundational organizational and computational tool for dealing with a lot of information all at once. It is used in many modern and growing fields, such as data science, machine learning, statistics, and computer science. This course is an introduction to the objects and tools of linear algebra, with an emphasis on applications. We will study vectors, norm, and angle; linear independence and orthonormal sets; their applications to document analysis; clustering and the k-means algorithm; matrices; left and right inverses and solving matrix equations; QR factorization; least-squares and model fitting. Computation, both operationally and its relationship with real-world problems, will be central to this course.

### **21100 Calculus III (4 cr.)**

**Prof. Visscher**

This course is an extension of the ideas and tools of differential and integral calculus to 2 and 3 dimensions, with a view toward further generalizing to *even higher dimensions(!)*. We will study the geometry of vectors and some of the structures of a vector space, and develop calculus tools for studying number- and vector-valued functions of multiple variables. If you like calculus, physics, stretching your mind to visualize mathematics, or some combination of these, then this course is for you!

**21600 Statistical Analysis (3 cr.)****Prof. Weinberg**

We are surrounded by data! We interpret these data to draw conclusions and make decisions about politics, health, education, and many other subjects. The heart of statistics—and the main focus of this course—is drawing inferences about populations based on data in samples. This course is designed to help you decide how to collect and organize data, how to use computer simulation techniques to draw inferences and make decisions based on your data, and to explore the mathematical underpinnings of the statistical theory. The course will culminate in a statistical study that you design and implement, including obtaining a sample and writing a technical report.

**24600 Intermediate Statistics (3 cr.)****Prof. Geteregechi**

With every passing day, the world around us is getting increasingly complex. People are discovering relationships among variables that were previously thought to be unrelated. What this means is that society needs people with the right knowledge and skills for understanding the complexities of the world that we live in today. This course will introduce you to various multivariate analyses techniques that will boost your statistical knowledge. You will also learn about methods that do not rely on specific distributions like the normal distribution as well as other useful techniques like bootstrapping. All these will be done with the use of the popular environment R.

**26200 Ethnomathematics (3 cr.)****Prof. Yürekli**

Ethnomathematics explores intersections of culture, historical traditions, sociocultural roots, and mathematics. It studies mathematical ideas arising from world cultures, recognizes contributions of non-Western societies to the history of mathematics, and explores mathematical thinking outside of traditional Western mathematics. This course introduces students to the role of mathematics in different societies, how mathematics relates to other disciplines including history, linguistics, fine arts, architecture, and how under-represented groups can develop self-confidence and interest in mathematics through a study of cultural heritage.

**30300 Abstract Algebra (4 cr.)****Prof. Wiesner**

Abstract Algebra emerged from the study of many different mathematical questions: studying number systems, solving equations, understanding symmetry. Mathematicians have found that these different questions have much in common, and progress has been made on them by generalizing and abstracting. This has led to the modern field of Algebra. In this class, we will focus on one piece of this story: the algebraic structures known as groups.

To study this field, we will take an inquiry-based learning (IBL) approach: we'll work through a sequence of tasks that lead us on a tour of important concepts and examples, engaging us in rich mathematical thinking along the way.

**32100 Graph Theory and Combinatorics (3 cr.)****Prof. Geteregechi**

Have you ever wondered how many ways there are to assemble an ice cream sundae? Or the most efficient way to plan a multi-city trip? Or why bunny reproduction has a lot in common with floor tilings? Graph Theory and Combinatorics has the answer to all these things! Graph Theory is the study of “connections” and introduces tools to be able to answer useful questions about those connections. Combinatorics focuses on “discrete structures” overall (discrete structures = things that can be counted with the integers), how to count them, and how they relate to each other. Do fractions ever get you down? Then Graph Theory and Combinatorics might be right for you!

**33100 Data Science with R (3 cr.)****Prof. Maceli**

Modern data science brings together programming, statistics, and mathematical skills to understand the world. The course focuses on data visualization and modeling, while also covering topics related to data management and programming in the R environment. Students use theory together with programming and statistical methods to develop the capacity to create new and unique models, visualizations, and/or solutions in data-based multidisciplinary investigations into problems from a variety of fields.

**39700 Junior Seminar (1 cr.)**

**Profs. Galanthay and Wiesner**

This course is an exploration of the skills, challenges, and work of a *full mathematical project*. The open landscape of a mathematical project can be both exciting and overwhelming—in this course we will focus on some of the disciplines and skills one can use to navigate this landscape well. For example: forming and refining questions, organizing possibilities, deciding what to explore further and what to postpone or abandon, recording ideas in various states of completeness, communicating your work with others and using your audience as a resource in your work, and crafting a final report of your work are all activities that bring structure and human ingenuity to the landscape you explore.

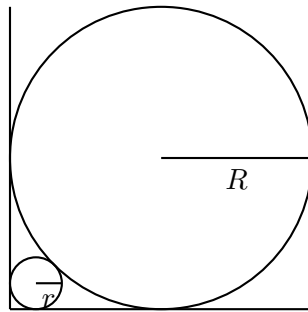
**48000 Connections in Advanced Math (3 cr.)**

**Prof. Moore**

This connections course will investigate geometric ideas broadly including hyperbolic and elliptic systems and their relationships with other areas of mathematics, as well as ways to explore and communicate those ideas.

**$\nu_2$ : What's the Problem... with Professor Brown**

A circle of radius  $r$  is drawn tangent to the  $x$ -axis and the  $y$ -axis in the first quadrant. A circle of radius  $R > r$  is drawn (in the first quadrant) tangent to the first circle and to both axes. What is the ratio  $R/r$ ? Give exact answer, if possible.



Send complete answers to Professor Brown at [dabrown@ithaca.edu](mailto:dabrown@ithaca.edu). Those submitting correct answers will have their names printed in the following newsletter. People who correctly solve all problems from Volume 3 of the newsletter will receive a special prize at the end of the year.

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*Solution to Prof. Brown's previous problem:*

The solution to last newsletter's problem is rather long, so I am going to just give out the answer: The lottery will give out an equal number of bicycles and pumpkins.

*Honor role* (solvers from Issue 2): Earth Sonrod (current student), Austin Ruffino (current student), Michael Avanesian (current student)

### $\nu_3$ : Math in the News

A few recent articles about math in the news.

The Ithacan: [Women in Math Day encourages young girls to pursue math](#)

New York Times: [Is Geometry a Language That Only Humans Know?](#)

Quanta Magazine: [What a Math Party Game Tells Us About Graph Theory](#)

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*One geometry cannot be more true than another; it can only be more convenient.  
Geometry is not true, it is advantageous.*

—Robert Pirsig  
(author of *Zen and the Art of Motorcycle Maintenance*)