Presentation of the Major in Mathematical Sciences

FALL 2022

SMITH COLLEGE

What do Mathematicians Do?

"The universe cannot be read until we have learned the language and become familiar with the characters in which it is written. It is written in mathematical language, and the letters are triangles, circles and other geometrical figures, without which means it is humanly impossible to comprehend a single word. Without these, one is wandering about in a dark labyrinth"

Galileo Galilei (1564-1642)

Mathematics is a profoundly human Endeavor. It reflects a need we have as a species. Through their work, Mathematicians build a language that allows us to experience in a quantitative and self consistent fashion the complexity of nature. The language is used by Physicists, Engineers, Economists,…

Why study Mathematics?

- Because you are drawn to logical analysis, patterns and structure.

- Because it is a powerful and beautiful language that can be used to model and predict systems from biology, physics, engineering, …

- Because it opens up a wide range of appealing job opportunities…

Where do Smith Math Major graduates work

evolve24

Twilio Inc.

Google

City Year (Americorps)

Hospice of the Fisher Home (nursing)

Aetna / CVS Health

World Bank Group
Xerox
Spotify

Public Financial Management

Liberty Mutual Insurance

MassMutual
Morgan Stanley
Center for Computing Sciences/IDA

Where have Smith Math Majors gone for graduate school

- Brown
- University of Washington
- Rice
- Brandeis
- Emory
- Cornell
- Dartmouth
- Duke
- Minnesota
- North Carolina State

Wall Street Journal Article

2014 Ranking of the Best and Worst Jobs

1. MATHEMATICIAN

   Applies mathematical theories and formulas to teach or solve problems in a business, educational, or industrial climate.

3. STATISTICIAN

   Tabulates, analyzes, and interprets the numeric results of experiments and surveys.
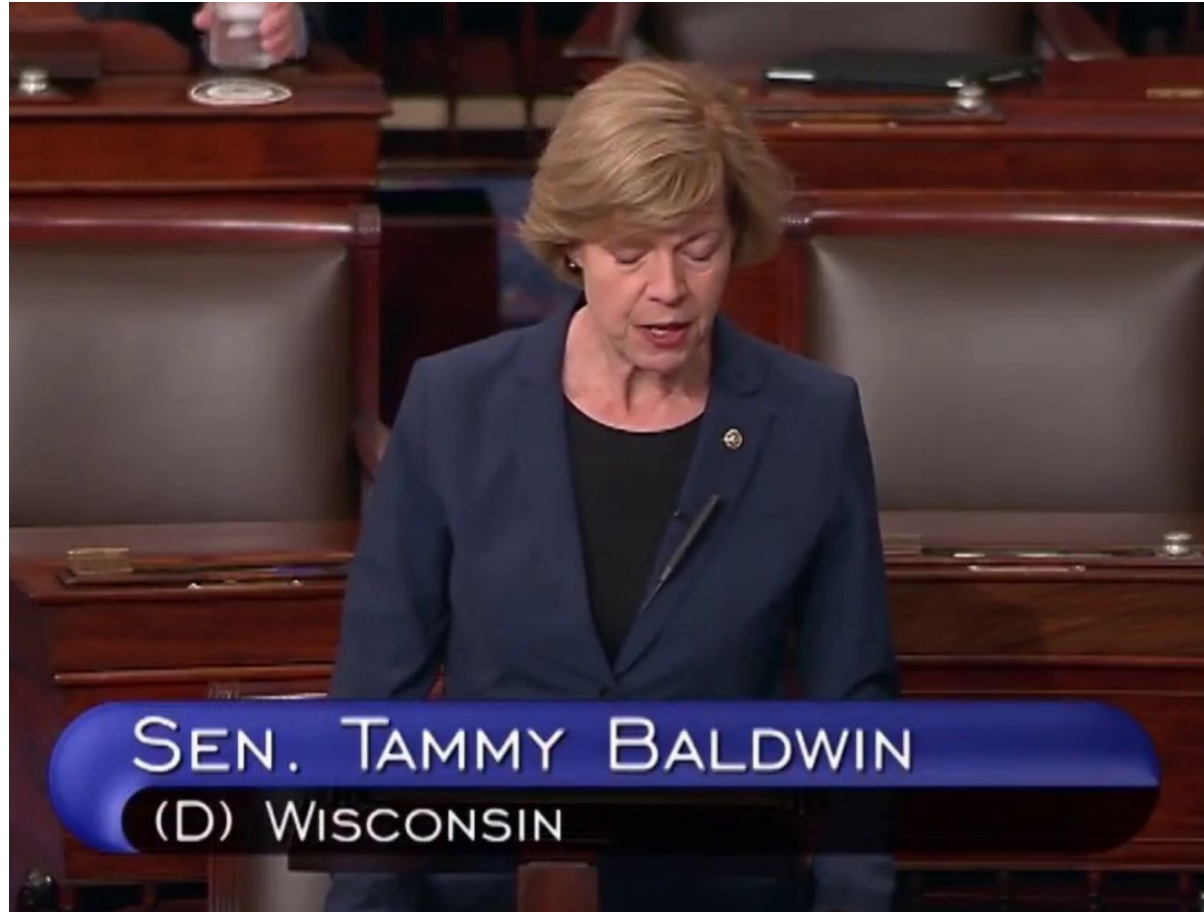
4. ACTUARY

   Interprets statistics to determine probabilities of accidents, sickness, death, & property loss from theft & natural disasters.

Where do Mathematicians Work?

- Arts, entertainment, and recreation

- Education

- Finance and insurance

- Government

- Health care and social assistance

- Information technology

- Legal services

- Management of companies & enterprises

- Manufacturing

- Nonprofit

- Other science and technology

- Retail trade

- Transportation & warehousing

- Utilities

http://www.ams.org/early-careers/
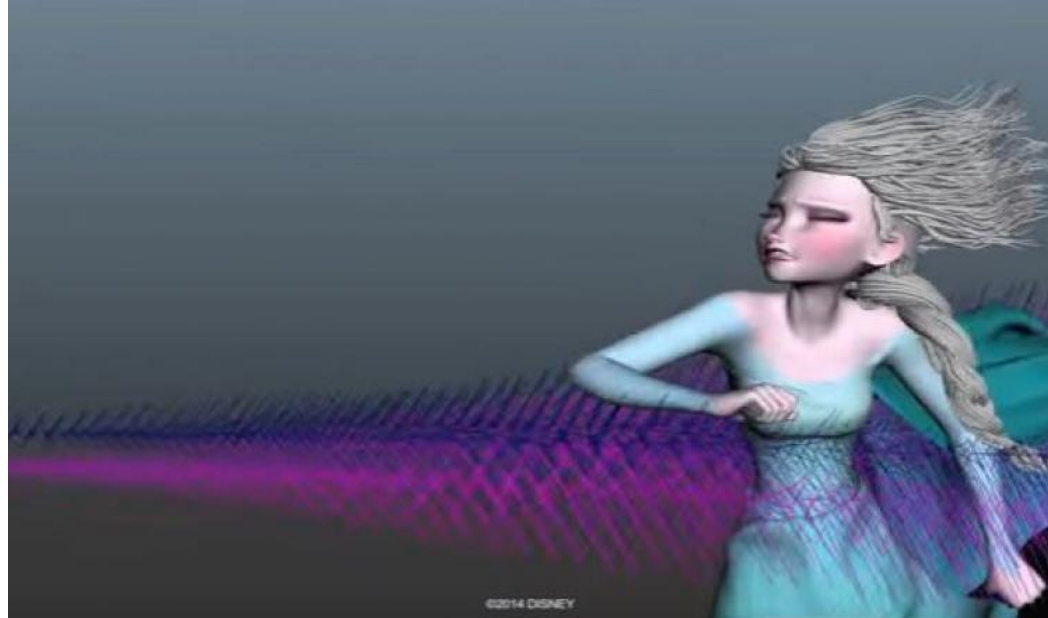
Careers in government!

Tammy Baldwin, Math Major, Smith class of 1984

Mathematical Models for Global Warming

Mathematics in Entertainment

Alex McAdams, a mathematician working at Disney Studios used math modeling and computational physics to do realistic hair simulations in the movies Tangled and Frozen

A History of Inclusion and Excellence...

Euphemia Haynes

Was the first African-American woman to receive a doctoral degree in mathematics (PhD Catholic University of the Americas, 1943).
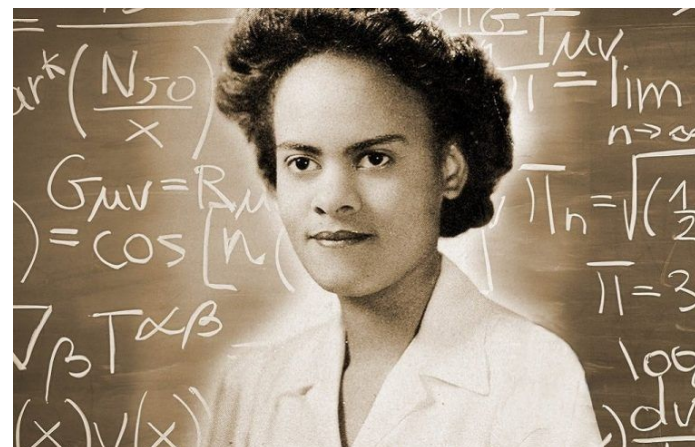
Se was a Math Major at Smith, class of 1914.

Evelyn Boyd Granville

Was the second African-American woman to receive a Ph.D. in mathematics from a US University (PhD 1949 Yale).

She was a Math Major at Smith, class of 1945. Her research was in the field of computing.

...Continuing to Today

- Center for Women in Mathematics
- Women in Math in New England
- Postbacc program@Smith
- Calculus Training Group program
- Inclusive Active Learning and Curriculum development
- Ongoing department conversations about DEI at Smith and beyond

- AEMES program
- McKinley fellowships
- Science Center Committee on Diversity (SCCD)

Faculty and Students partner in DEI initiatives at Smith

Taking care of each other

Academic Support Services

↑ **The Jacobson Center for Writing, Teaching and Learning** offers writing, speaking, learning and tutoring services.

↑ **The Spinelli Center for Quantitative Learning** offers tutoring, workshops and study sessions on quantitative work across the curriculum.

↑ **The Lazarus Center for Career Development** offers advice on internships, graduate school and career opportunities that align with your major.

Important Contact Numbers for Mental Health Concerns or Crises:

On Campus:

Counseling Service	413.585.2840
Campus Police	413.585.2490

Local, Community Based:

Clinical & Support Options (24/7 crisis hotline):	413.586.5555
Center for Women & Community (Support for survivors of sexual assault, all genders; 24/7 hotline)	413.545.0800
Safe Passage (interpersonal Violence, 24/7 hotline)	413.586.5066

National Support Hotlines:

National Suicide Prevention Lifeline	1.800.273.8255
The Trevor Project (LGBTQ Suicide Hotline) (for those 24 years of age or younger)	1.866.488.7386
Trans Lifeline	1.877.565.8860

Text or Online Support

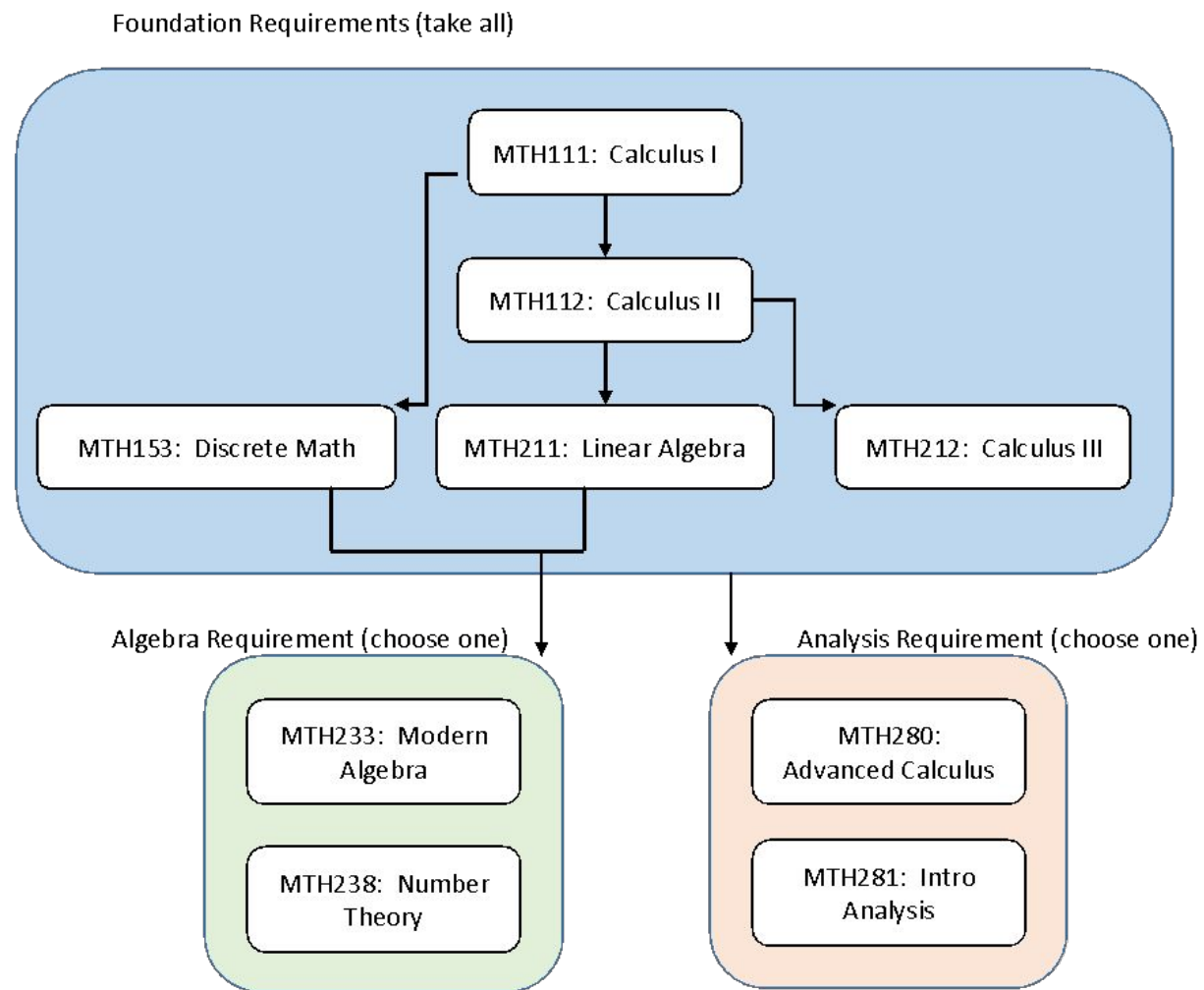|	
Crisis Text Line	Text HOME to 741741
Crisis Text Line for Students of Color	Text STEVE to 741741
7 Cups Online Therapy & Free Counseling	www.7cups.com
7 Cups Online Support for Students of Color	www.7cups.com/home/poc/
Online LGBTQ Counseling	www.pridecounseling.com

Smith College Counseling Service

Menu of Math Majors

- Classic Mathematics Major (MTH)
- New! Joint SDS/MTH major in Mathematical Statistics (MST)
- Spoiler: Applied Math Track in the Mathematics Major? (soon…)

Common double majors with MTH or MST

- Computer Science
- Economics or Quantitative Economics
- Physics
- Engineering
- Education
- Biology (Math bio certificate)
- Neuroscience

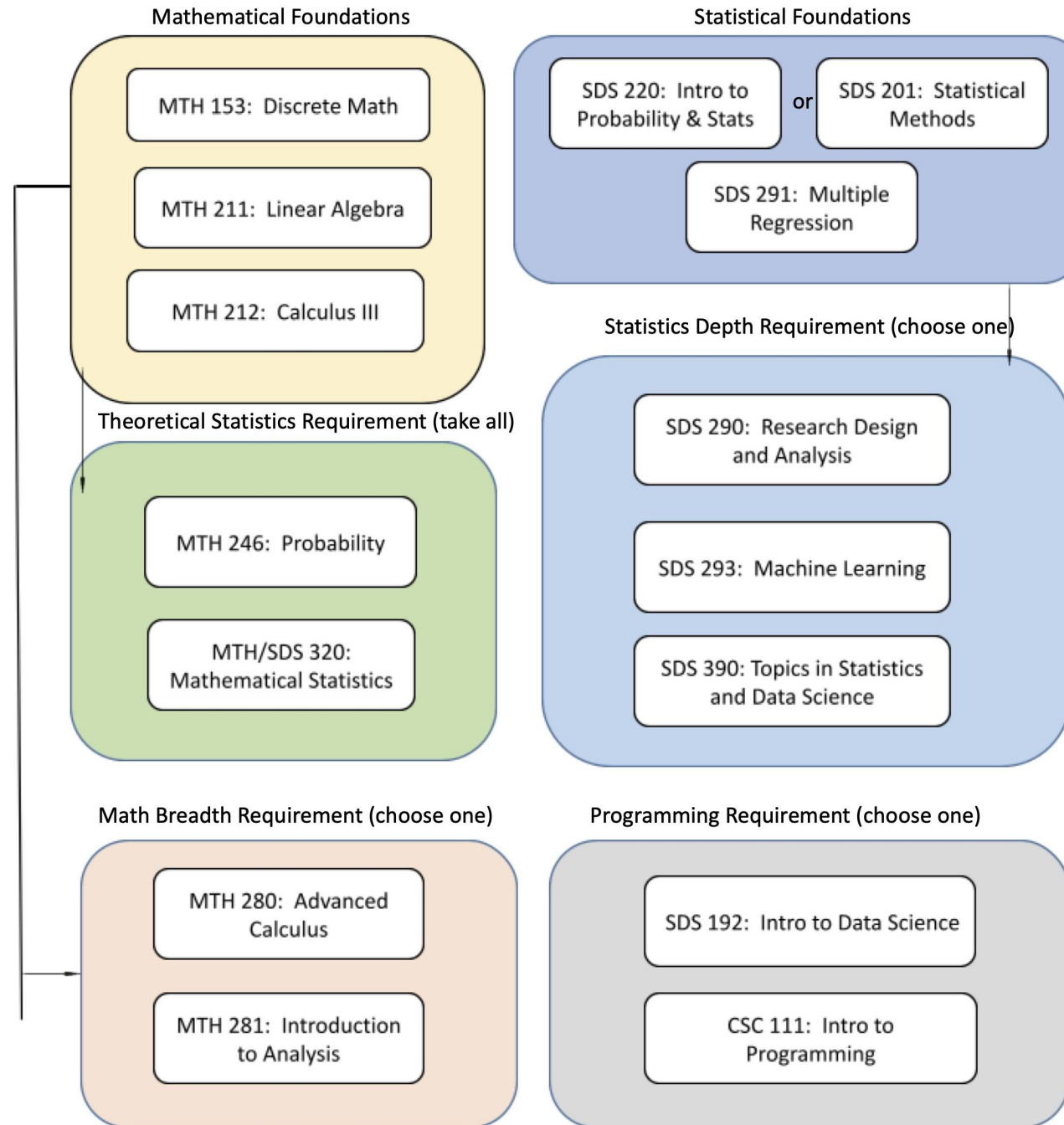Double majoring is easy! Many cross-listed courses.

MTH

Foundation Requirements (take all)

MTH111: Calculus I

MTH112: Calculus II

MTH153: Discrete Math

MTH211: Linear Algebra

MTH212: Calculus III

Algebra Requirement (choose one)

MTH233: Modern Algebra

MTH238: Number Theory

Analysis Requirement (choose one)

MTH280: Advanced Calculus

MTH281: Intro Analysis

Depth Requirement: At least one course numbered MTH310-390

Credit Requirement: A total of 36 credits numbered 153 or above is required for the major*

*With approval of the department, up to 8 of the credits may be satisfied by courses containing significant mathematical or statistical content taken outside of the MTH department. Generally such a 4-credit course will be given 2 credits towards the major.

MST

Mathematical Foundations
- MTH 153: Discrete Math
- MTH 211: Linear Algebra
- MTH 212: Calculus III

Statistical Foundations
- SDS 220: Intro to Probability & Stats **or** SDS 201: Statistical Methods
- SDS 291: Multiple Regression

Theoretical Statistics Requirement (take all)
- MTH 246: Probability
- MTH/SDS 320: Mathematical Statistics

Statistics Depth Requirement (choose one)
- SDS 290: Research Design and Analysis
- SDS 293: Machine Learning
- SDS 390: Topics in Statistics and Data Science

Math Breadth Requirement (choose one)
- MTH 280: Advanced Calculus
- MTH 281: Introduction to Analysis

Programming Requirement (choose one)
- SDS 192: Intro to Data Science
- CSC 111: Intro to Programming

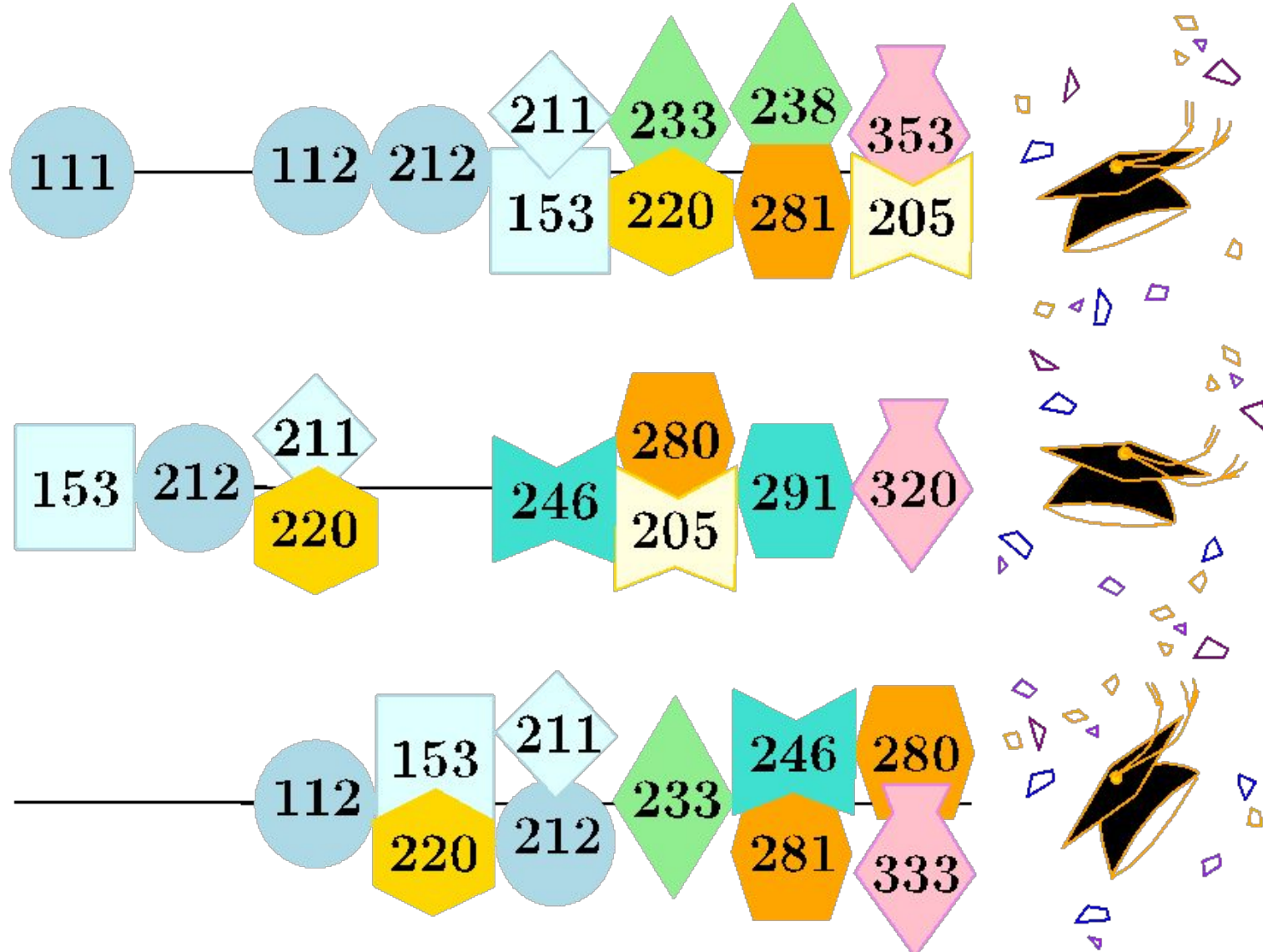# Requirements for the minors

- Math Minor:

  MTH 211 (Linear Algebra) and 16 credits taken from among the following: MTH 153 (Discrete), MTH 205 (Modeling), and courses numbered above MTH 211, including two courses numbered at or above MTH/SDS 220 (Stats).

- Applied statistics minor in the Program of Statistics and Data Science

  Consists of five courses: introductory statistics (SDS220), plus two intermediate statistics classes and two (or more) courses from an approved list.

A Major in Mathematics is very flexible!

Biomathematical Sciences: 5 College Certificate

- Integrates Math, Stats, Comp Science and Engineering with Bio, Biochem and Neuroscience.
- A gateway course (MTH 205 Modeling in the Sciences or other such courses in the 5 Colleges)
- Four electives in bio sciences (if you're a math major)
- One research experience
- A capstone experience (a biomath oriented 3XX course or a thesis)
- Students normally apply in their sophomore year

https://www.fivecolleges.edu/biomathematics

- Contact person: Dr. Golé

It Helps to Start Planning Early!

Frequency of Offerings (rule of thumb):

- **Both semesters:** Calc I, II, III (111, 112, 212), Discrete 153, Linear Algebra 211, Prob & Stats 220, Regression SD 291, Dialogues + Topics: research 300/301
- **Fall:** Number Theory 238, Probability 246, Differential Equations 264, Analysis 281, two 3XX (one applied the other theoretical)
- **Spring:** Modeling 205, Modern Algebra 233, Advanced Calc 280, Math Stats 320 and two other 3XX (one applie the other theoretical) (Spring 22: Partial Differential Equations 364, Advanced Linear Algebra 333)
- **Every Other Year:** Complex Analysis 282, Geometry 270, Combinatorics 254, Graph Theory 255

Class offerings

Class #	Name	Spring 23	Fall 23
105	MathStudio: Making, Mat	☑	☐
111	Calculus I	☑	☑
112	Calculus II	☑	☑
153	Discrete Math	☑	☑
205 (MTH/CSC)	Modeling in Sciences	☑	
211	Linear Algebra	☑	☑
212	Calculus III	☑	☑
220 (SDS)	Proba & Stats	☑	☑
233	Modern Algebra	☑	
238	Number Theory		☑
246	Probability		☑
254	Combinatorics	☑	
255	Graph Theory	24	
264	Differential Equations		☑
270	Geometry	24	
280	Advanced Calculus	☑	
281	Intro Real Analysis		☑
290 (SDS)	Research Design	☑	
291 (SDS)	Multiple Regression	☑	☑
300	Dialogue	☑	☑
301	Topics: Research	☑	☑
320 (MTH/SDS)	Math Stats	☑	
325 IDP	Math Studio		TBD
333	Adv. Algebra		TBD
353	Topics Applied Discr.		TBD
364	Topics Applied Conts	☑	
370	Topics Geom/Topo		TBD
381	Topics Analysis		TBD
382	Complex Analysis	☑	

☑ : Every such semester

Some courses from other depts. count for 2 or 4 CR. See catalogue

Normally: 320 every spring, and two other 3XX each semester: one applied one theoretical

Study Abroad

- Take math classes in another language? (e.g Sciences à Paris: 1-2 year French)

- Take no math classes abroad? (many programs)

- A study abroad program that is math intensive? (Budapest - In English, Semester, Year or Summer)

Externally funded Research opportunities with Math faculty

Patricia Cahn: National Science Foundation - "Branched Covers in Dimensions 3 and 4", 2022-2027. The goal is to use computer experimentation to study invariants of knots, with applications to 4-dimensional topology.

Luca Capogna: National Science Foundation – "Applications of Quasiconformal Geometry and Partial Differential Equations" 2020-2023. The goal is to explore properties of solutions of partial differential equations to study certain problems in geometry.

Candice Price – National Science Foundation - "DNA Knot Shadows Exploration", 2022-2024. The goal is to use combinatorial tools to study projections of DNA knots.

Julianna Tymozcko – National Science Foundation - "Combinatorial Group Actions and Applications to Geometry, Knot Theory, and Representation Theory", 2021-2024. The project studies group actions using combinatorial tools such as graphs and tableaux in order to characterize their underlying algebraic structures.

Math Research: At Smith: MTH 301, SURF and more.
Outside Smith: REU and Internship Applications

https://www.nsf.gov/crssprgm/reu/list_result.jsp?unitid=5044

Choosing an advisor

Possible Math Major and Minor Advisors:

In MTH: Pau Atela, Jennifer Beichman, Patricia Cahn (sabbatical S23), Luca Capogna, Christophe Golé, Rajan Mehta (sabbatical 22-23), Candice Price (sabbatical 22-23), Geremıas Polanco, Becca Thomases, Julianna Tymoczko.
Also: Benjamin Baumer (SDS), Ileana Streinu (CSC).

Possible MST Advisors: All MTH advisors above, plus Ben Baumer, Katherine Kinnaird, Lindsay Poirier, and Scott LaCombe in SDS.

To declare, fill out an advising form! See MTH and (soon!) MST websites.

More ways to connect

- Jobs! Graders and QM Tutors - sign up if interested!
- Math Club/AWM chapter! Contact Abigail Bowering, Dr. Olive and Dr. Capogna
- Putnam team! Contact Dr. Belton, Dr. Olive and Dr. Polanco
- Thursday Lunch Talks!
  Talks about different cool math topics, pure or applied, as well as career oriented.
- Center for Women in Math: Postbacc program & WIMIN
- Research! 301, SURF, Special Studies, McKinley Fellowship, etc.
- T-Shirt design contest for the Smith Math Major Official T-Shirts!!!

Putnam Pizza and Problem Solving Session

Every Monday from 10/31 to 12/3, 2022
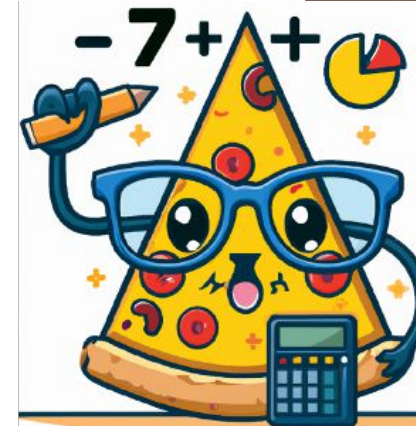**time: 5:30-6:45 pm**
Where: Burton 307

The Perfect Intersection of Math, Pizza and Fun

Come and Join us to have fun while
- Working on math problems beyond course content
- Sharing ideas with Friends
- Sharpening your problem Solving Skills
- Eating delicious pizza

(Everyday it's a different self-contained topic. So attend whenever you can. Feel free to arrive earlier or later)

You can choose to participate in the Putnam Exam (or not) on Dec 3rd, 2022

For more information: Robin Belton (rbelton@smith.edu), Xavier Ramos(xramosolive@smith.edu) and Geremias Polanco (gpolanco@smith.edu)

Smith Math Club/AWM chapter

==First Meeting Tuesday November 1st, at 5pm in the Math Forum==

==Second Meeting: Tuesday, November 8th at 5pm in the Math Forum: Movie "Secrets of the Surface" about the life of Field Medalist Maryam Mirzakhani. Professor Susanna Ferguson (Smith, Middle East Studies) will share remarks and help with the discussion after the movie.==

- Meet and Greet
- Study with Friends and Chocolate
- End of semester gala
- Trivia Nights
- Movie nights and post-movie discussion (with popcorns!): November 8th, 5pm
- Networking with Alumnae
- Career Events
- T-Shirt design competition
- Outreach to K12 students in the Campus School
- … and much more

For more information: Abi Bowering (abowering@smith.edu), Xavier Ramos Olive (xramosolive@smith.edu) and Luca Capogna (lcapogna@smith.edu)

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Online LGBTQ Counseling   www.pridecounseling.com

Smith College
Counseling Service