Mathematical Sciences Information Session

Department of Mathematical Sciences
Claremont McKenna College

August 30, 2013

Welcome to CMC Mathematical Sciences!

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Today we will:

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Today we will:

- Introduce ourselves

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- Tell you about our courses and programs

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- Discuss some of the math-related resources and research opportunities available to CMC students

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- Introduce ourselves
- Tell you about our courses and programs
- Discuss some of the math-related resources and research opportunities available to CMC students
- Answer your questions

Who we are:

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- **Asuman Aksoy**, *functional analysis*, teaching MATH 60 and MATH 137

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- **Asuman Aksoy**, *functional analysis*, teaching MATH 60 and MATH 137
- **Gerald Bradley**, *matrix theory and math education*, teaching MATH 30 and MATH 111

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- **David Krumm**, *number theory and arithmetic geometry*, teaching MATH 30

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- **Art Lee**, *computer science*, teaching CSCI 51 and CSCI 62

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- **Deanna Needell**, *applied mathematics and statistics*, teaching MATH 151 and MATH 168

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- **Randy Swift**, *probability*, teaching MATH 31

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- **John Sun**, *computer science*, teaching CSCI 62
- **Randy Swift**, *probability*, teaching MATH 31
- **Robert Valenza**, *philosophy of mathematics*, teaching MATH 30

Math GE and applied math at CMC

Mark Huber
Department of Mathematical Sciences
Claremont McKenna College

August 30, 2013

Everyone at CMC takes at least one math course

From the catalog: General Education Requirement

Any CMC mathematics or computer science course

Translation

You don't have to take Calculus to satisfy the requirement.

Any course at CMC designated MATH or CSCI.

So what should you take?

Introductory courses in the mathematical sciences

Intro Stats	Intro Comp Sci
MATH 052	CSCI 051

The Calculus sequence

Derivatives	Integrals	Multivariable
Calculus I	Calculus II	Calculus III
MATH 030	MATH 031	MATH 032

Courses not offered this year (might offer in future)

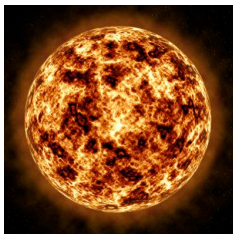| Intro to Pure Math	Calculus & Discrete Models
MATH 035	MATH 038

What is Applied Mathematics?

Applied Mathematics

Using mathematical tools to solve practical problems.

Science

Business

Industry

Folks who should take Calc I, II, or III

- ▸ Know that you are going to be taking Multivariable Calculus
- ▸ Planning to be a physics or math major
- ▸ Know that you want to take advanced probability/statistics
- ▸ If you want to be a quant someday

Moving ahead!

Past experience counts

- ▶ No course credit for AP Calculus...
- ▶ ...but does allow you to move ahead in sequence
- ▶ Rougly speaking
  - ▶ 4 or 5 on AB Calculus Exam = skip Calculus I
  - ▶ 4 or 5 on BC Calculus Exam = skip Calculus II
  - ▶ Programming experience = skip Intro to CS
- ▶ Talk to us! We want you to be in the right course!
- ▶ Advantage of CMC: you get one-on-one time with profs

No matter your experience, still have to take a math course at CMC

Applied math courses at CMC

All math majors take the four core courses

Applied Math required courses
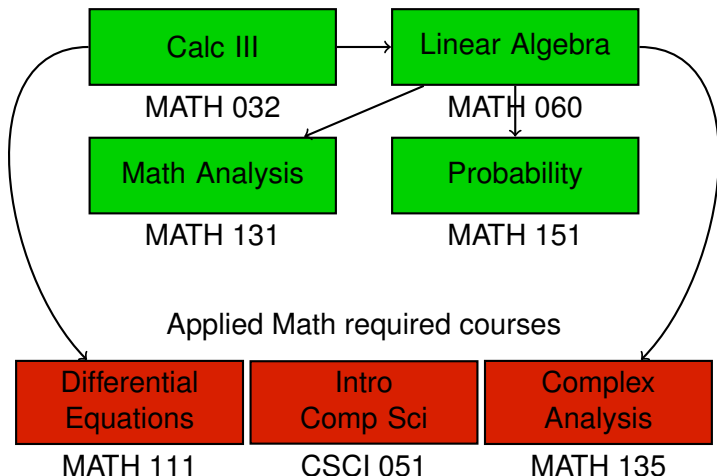
With four more elective courses...

Applied Math Electives

Linear Algebra (Math 60) Prerequisite:

Math Finance	Deterministic Oper. Res.	Discrete Geometry	Game Theory
Wavelets			

Probability (Math 151) Prerequisite:

Statistical Inference	Stochastic Processes	Monte Carlo Methods	Stochastic Oper. Res.

Linear Algebra and Differential Equations Prerequisite:

Partial D.E.s	Numerical Analysis

Variety is the spice of life

- ▶ Need at least one discrete (red) and continuous (green)
- ▶ Most upper level CS courses also qualify
- ▶ Can sub in one pure math course

A typical major in applied math track

Someone who decided they liked probability...

Calculus I (MATH 030)
Calculus II (MATH 031)
Calculus III (MATH 032)
Linear Algebra (MATH 060)
Math Analysis I (MATH 131)
Probability (MATH 151)

Fundamentals of Comp. Sci (CSCI 052)
Differential Equations (MATH 111)
Complex Analysis (MATH 135)

Monte Carlo Methods (MATH 153)
Statistical Inference (MATH 152)
Stochastic Process and Modeling (MATH 156)
Intro to the Mathematics of Finance (MATH 109)

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Emphasis on differential equations:
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Linear Algebra (MATH 060)
Math Analysis I (MATH 131)
Probability (MATH 151)
Intro to Comp. Sci (CSCI 051)
Differential Equations (MATH 111)
Complex Analysis (MATH 135)
Partial Differential Equations (MATH 182)
Scientific Computing (MATH 164 HM)
Monte Carlo Methods (MATH 153)
Fourier Analysis (MATH 139)

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Pure math at CMC

Lenny Fukshansky
Department of Mathematical Sciences
Claremont McKenna College

August 30, 2013

What is pure mathematics?

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Pure or **theoretical** mathematics studies abstract mathematical structures and relations among them. Historically, the numerous fundamental applications of mathematics to science, technology, economics, and social sciences resulted from the advancement of pure math.

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- **Topology** investigates properties of geometric objects that are preserved under continuous deformations, such as stretching without tearing or gluing.

Why study pure math?

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- According to the Department of Education studies, the number of math courses a person takes in college is the single best predictor of their lifetime earnings.

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- We offer many exciting opportunities for undergraduate research in mathematics.

Typical pure math major at CMC

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The core courses
MATH 30, 31, 32 – Calculus sequence
MATH 60 – Linear Algebra
MATH 131 – Real Analysis I
MATH 135 – Complex Analysis
MATH 140 – Modern Geometry
MATH 151 – Probability
MATH 171 – Abstract Algebra I

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MATH 30, 31, 32 – Calculus sequence
MATH 60 – Linear Algebra
MATH 131 – Real Analysis I
MATH 135 – Complex Analysis
MATH 140 – Modern Geometry
MATH 151 – Probability
MATH 171 – Abstract Algebra I
The elective courses (choose 4)
Analysis: MATH 130 - 139
Geometry/Topology: MATH 140 - 149
Probability/Statistics: MATH 150 - 159
Algebra/Number Theory: MATH 170 - 179

Math resources at CMC and in the 5-C

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- The 5-C **main library** has one of the most extensive mathematics collections in Southern California.

Computer Science at CMC

Art Lee
Department of Mathematical Sciences
Claremont McKenna College

August 30, 2013

General Education Requirements:
Mathematics or Compute Science

- Catalog: "*Any CMC mathematics or computer science course*"

- CS courses available for freshmen:
  - CSCI 51 Introduction to Computer Science
  - CSCI 62 Data Structures and Advanced Programming (if you have already taken a 51-equivalent)
  - CSCI 52 Fundamentals of Computer Science (if you have already taken a 51-equivalent)

CS Programs at the Colleges:
All Available to CMC students

- Computer Science Sequence at CMC
  - Requires five CS courses and Discrete Mathematics
  - Seamless transition to a full major at Pomona or HMC

- Full Major in Computer Science
  - Through Pomona or HMC

CS Courses At the Colleges

- CS 51, 52, and 62 at CMC or Pomona are equivalent to CS 5, 60, and 70 at Mudd (stay with one sequence though!)

- After completing either of the above 3-course sequences, you may continue with the upper division CS courses at any of the Claremont Colleges

A Typical CS Sequence at CMC

- Required:
  - CS 51 Introduction to Computer Science
  - CS 62 Data Structures and Advanced Programming
  - Math 55 Discrete Mathematics (or CS 55 at Pomona)

- Electives (? wish list ?)
  - CS 105 Computer Systems
  - CS 140 Algorithms
  - CS 133 Database Systems
  - (Or almost any three of the very many upper-level CS courses at the 5-C)

A Typical CS Major at Pomona

- Required:
  - CS 51 Introduction to Computer Science
  - CS 62 Data Structures and Advanced Programming
  - CS 52 Fundamentals of Computer Science
  - Math 55 Discrete Mathematics (or CS 55 at Pomona)
  - CS 81 Computability and Logic (? May be eliminated soon ?)
  - CS 105 Computer Systems
  - CS 131 Programming Languages
  - CS 140 Algorithms

- Electives
  - 3 upper-level CS courses
  - Senior Project (or Senior Thesis) (1- or 2-semesters)
  - Senior Seminar
  - CS Colloquium

A Typical CS Major at Mudd

- Required:
  - CS 51, CS 62, and CS 52 at CMC/Pomona (or CS 5, CS 60, and CS 70 at Mudd)
  - Math 55 Discrete Mathematics (or CS 55 at Pomona)
  - CS 81 Computability and Logic (??? May be eliminated soon ???)
  - CS 105 Computer Systems
  - CS 121 Software Development
  - CS 131 Programming Languages
  - CS 140 Algorithms
- Electives
  - 9 units of upper-level CS courses (roughly 3 courses)
  - Clinic (2 semesters)
  - CS Colloquium

CS Research Opportunities

- Many REU (Research Experience for Undergrads) opportunities all over the country including the local ones at Claremont (during summer)

- Senior thesis possibly combined with summer research (talk to the CS faculty at CMC, Pomona, and Mudd)

- Sometimes done in the form of an independent study

- Good way to find out if you might be interested in grad school or not

Life after CMC

- Grad school in CS (even with just a CS sequence)

- Industry
  - Join one of many companies such as Google, Apple, Microsoft, Facebook, Atlassian, etc. etc. etc.
  - Join a start-up or a midsize company
  - Start your own start-up

Claremont Computer Club

- CMC students meet on Friday afternoons to exchange computing tips and learn from each either

- Contact me for the exact info

A Piece of Advice

- If you think there is a chance that you might be interested in CS, take a CS course (e.g., CS 51) early in your college life

- Often students take one (usually CS 51) in their senior year and say: "I should've taken this three years ago."

- If you don't like it after that one course, heck, you will have learned your share of computer science that you should anyway!

For Further Information

- Contact:

    Prof. Art Lee

    216 Adams Hall

    alee@cmc.edu

    909-607-0410

- Visit the CS Sequence Website:

    http://www.cmc.edu/math/CS/

UNDERGRADUATE RESEARCH IN MATHEMATICS

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- solving previously unsolved problems
- creating and analyzing new mathematical tools and models to better understand and predict phenomena

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- Senior Thesis projects

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- Summer research opportunities at CMC
- Senior Thesis projects
- Research for course credit

UNDERGRADUATE RESEARCH IN MATHEMATICS

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- Contributing to overall human knowledge, the thrill of discovery

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- Your name associated with new mathematics for posterity

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- Summer pay, course credit
- Opportunities to speak at conferences
- Advantages when applying for graduate school and jobs

In conclusion...

You can find much more information about our department, our
courses, programs, major options, and research opportunities on
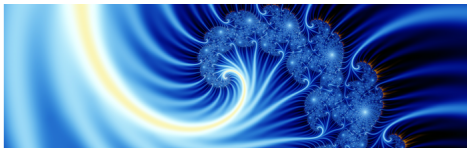our webpage:

http://math.cmc.edu

You can find much more information about our department, our courses, programs, major options, and research opportunities on our webpage:

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Please pick up a booklet of placement tests on your way out – these tests are for your benefit only to help you assess your preparation for Calculus I (MATH 30), Calculus II (MATH 31), or Calculus III (MATH 32).

Welcome to CMC!!!

Good luck with your studies!