

COMAP Mathematical Contest in Modeling: Overview and Advice

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COMAP Mathematical Contest in Modeling

What is the MCM?

It's an international contest for college undergraduates that challenges teams of students to clarify, analyze, and propose solutions to open-ended problems.

<http://www.mcmcontest.com/>

When is it this year?

Thursday, February 13–Monday, February 17, 2020

COMAP Mathematical Contest in Modeling

What's in it for you?

- challenge your brain
- solve a real world math problem
- get recognition for it on an international stage
- develop your interpersonal skills through teamwork
- impressive resume credential and an advantage when applying for internships/graduate school/jobs
- chance for your team to win the International COMAP Scholarship Award

COMAP Mathematical Contest in Modeling

What types of problems are to be solved?

Each team (consisting of up to **3** students) chooses one of 3 MCM problems:

- Problem A: Continuous
- Problem B: Discrete
- Problem C: Data Insights

Math students should be well prepared for Problems A or B.

Problem C is suggested for those with strong statistics backgrounds.

Examples of Past Problems

Problem A: Continuous (2008)

Take a Bath: Consider the effects on land from the melting of the north polar ice cap due to the predicted increase in global temperatures. Specifically, model the effects on the coast of Florida every ten years for the next 50 years due to the melting, with particular attention given to large metropolitan areas. Propose appropriate responses to deal with this. A careful discussion of the data used is an important part of the answer.

Examples of Past Problems

Problem B: Discrete (2007)

The Airplane Seating Problem: Airlines are free to seat passengers waiting to board an aircraft in any order whatsoever. It has become customary to seat passengers with special needs first, followed by first-class passengers (who sit at the front of the plane). Then coach and business-class passengers are seated by groups of rows, beginning with the row at the back of the plane and proceeding forward.

Apart from consideration of the passengers' wait time, from the airline's point of view, time is money, and boarding time is best minimized. The plane makes money for the airline only when it is in motion, and long boarding times limit the number of trips that a plane can make in a day.

The development of larger planes, such as the Airbus A380 (800 passengers), accentuate the problem of minimizing boarding (and deboarding) time.

Devise and compare procedures for boarding and deboarding planes with varying numbers of passengers: small (85-210), midsize (210-330), and large (450-800).

Prepare an executive summary, not to exceed two single-spaced pages, in which you set out your conclusions to an audience of airline executives, gate agents, and flight crews.

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Get Prepared

- Read through COMAP's official directions at:
<http://www.mcmcontest.com/>
- Read through advice documents at:
<https://people.clas.ufl.edu/tstepien/mcm/>
- Read through past problems and determine features of successful solution papers
- Get to know your teammates
- Read through the tips in these slides to see how you really do not need to go crazy the weekend of the MCM

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Research!!!

- Use Google to find as many sources as possible for BOTH problems A and B
- Then decide which problem to solve (brainstorm: review ideas, what is most promising?)
- Use Google Search, Scholar, and Books
- You want to find models that already exist – then you do not need to come up with one completely on your own! Scholarly papers (or databases) and books should be your primary source of information
- Cool things like applets are also really helpful depending on the problem
- By the end of the night: LOTS of resources, beginnings of modeling

(We stopped working by 1:00am... definitely not an all-nighter)

Model, research, and write!!!

- The focus should be on making sure the model developed previously works and adding complexity to the model, or finish modeling the entire system
- Writing should begin as different parts of the model are finished
- By the end of the night: most of the modeling done, as much writing as possible

(We worked 11:30am-3:00pm, then 7:00pm-1:00am)

Model and write!!!

- Don't forget to check out the resources the libraries might have
- Explore model refinements, sensitivity, etc.
- By the end of the night: all of the modeling done, most of the writing done

(We worked 12:00pm-5:00pm, then 9:30pm-11:00pm)

Write!!!

- Make sure you have NO mistakes in your model
- Leave time to print a copy of the paper for each group member, individually proofread paper, and then go through it page by page and make corrections
- By the end of the night: writing completely done and proofread at least once

(We worked 11:00am-5:00pm, then 7:00pm-11:00pm)

Abstract!!!

- Each group member individually write an abstract, combine the best parts, then proofread and rework abstract a few times
 - The abstract needs to hook the judges
 - Provide some context and overview of problem
 - Describe what you did in general terms
 - Summarize main results
- Read through paper one last time to make final corrections
- Completely finish by 8pm and then submit a PDF of your paper and summary sheet (abstract) (*strict* deadline of 9pm)

(We were done by 6:30pm)

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Other Tips

- Try to read some applied mathematics scholarly journal articles before competing – this helps you get used to the style you should write in
- Excellent writing and grammar is key – we honestly did not think our model was absolutely super amazing awesome, but we explained everything as clearly as possible
- Only make the model as elaborate as you can fully understand and explain – they do not expect PhD level modeling for an undergraduate contest that lasts only 96 hours
- If you focus too much on your model, you will not have enough time to write about it and thoroughly explain it

Other Tips

- Make sure to validate your model with real sources – this can expose flaws that COMAP had in writing their problems and you want to make sure that you can back up your claims
- Pretend like you are writing the paper as a thesis, not as a contest paper
- Do not forget about Google Books and the library's access to eBooks

Other Tips

- At least one group member absolutely has to learn LaTeX (and BibTeX) and be relatively fluent in it before the contest begins
- The group should meet once before the beginning of the contest to determine when and where they will meet on Thursday night and to get an idea of class schedules and other demands for that weekend
- Basic LaTeX documents that follow all typesetting restrictions should be set up and ready to go before the contest begins
- Have a copy of all old code you have ever written so it can be pulled out and used immediately
- Follow @COMAPMath on Twitter for the most up to date information