Subject **MCM/ICM resources**
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Date 2022-02-13 09:10

Dear MCM/ICM contestants,

Here is a collection of resources you may find helpful for the contest. Please let me know if you can think of something else that would be useful for me to share in advance of the contest. More information concerning registration will follow probably tomorrow.
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A) Regarding contest strategy we have:
this document from one of our previous graduate coaches who was twice part of an outstanding team. some notes from our 2-time outstanding prize winning team (Joe, Emily, Yonatan from class of 2011), and notes from James, Alex, and Madison (double-prize winners in 2016).

Here's a list of various articles for how to approach the contest and please note the judge commentary advice on pp. 391-394 from 2020.

B) I've selected 4 "model papers" from previous Rensselaer teams on Problems A, B, D, E, that represent a good format for organizing your paper. These were each prize winning solutions.

http://eaton.math.rpi.edu/faculty/Kramer/MCM/ModelPapers.zip

C) LaTeX is a good way to write and compile documents with mathematics. A template for a paper can be found at
http://eaton.math.rpi.edu/faculty/Kramer/MCM/Template.tex

A sample paper and LaTeX source file for a paper from a previous contest can be found at:
http://eaton.math.rpi.edu/faculty/Kramer/MCM/samplepaper.tex
http://eaton.math.rpi.edu/faculty/Kramer/MCM/samplepaper.pdf

If you don't already know LaTeX and want to create the source file as a WYSIWYG process, you might try the free software LYX. A good collaborative LaTeX tool is overleaf.

For bibliography generation, look at the end of samplepaper.tex for the simplest approach (which is probably good enough). But if you want to be a bit fancier, you can use the companion program BibTeX but it seems a bit overkill for the purposes of the contest. A good Mac application that writes the BibTeX files from a more intuitive interface is BibDesk.

For pictures, one way is via TikZ.

D) Please note the matrix of problems from previous years. One thing you might do if you're stuck on how to apply some mathematical method to a problem you're interested in, you might look for a previous problem with a similar theme, and then scan the outstanding solutions (linked below for the methods that were used.

E) Outstanding solutions and judges commentary from previous years
can be accessed as follows:

For 2013-2021, we have the outstanding MCM/ICM solutions as separate files:
http://eaton.math.rpi.edu/faculty/Kramer/MCM/2021outstandingsolutions.zip
(change the year for 2013-2020)

For 2010-2012 these only give one outstanding solution for each problem (MCM and ICM):
http://eaton.math.rpi.edu/faculty/Kramer/MCM/2012mcmsolutions.pdf
(and for all years 2010-2012 by changing the year).
You can see more MCM/ICM solutions for 2010-2012 as separate files via:
http://eaton.math.rpi.edu/faculty/Kramer/MCM/2012moreoutstandingsolutions.zip
(and for years 2010-2012 by changing the year).

For 2001-2009, we have several solutions for each problem:
http://eaton.math.rpi.edu/faculty/Kramer/MCM/2009mcmsolutions.pdf
(and for all years 2001-2009 by changing the year).
For ICM:
http://eaton.math.rpi.edu/faculty/Kramer/MCM/2009icmsolutions.pdf
(and for all years 2006-2009 by changing the year).

F) Notes from practices from 2013-2022 can be accessed via
http://eaton.math.rpi.edu/faculty/Kramer/MCM/Practices/mcm22pracnotes1.pdf
and changing the year (13-21) and number at the end.

G) Videos for this year's practices:
"Contest Rules and Strategy"
"MCM Problem A Prize Paper Presentation"
"Optimization Algorithms for Problems A/B"
"MCM Problem C"
"ICM Problem E Prize Paper Presentation"

H) For doing research, you can of course start with simple google searches. If you'd like to try to target for more scholarly articles, here are links to some research databases:
https://guides.lib.rpi.edu/az.php

Particular databases of interest are:
"Scopus" and "PubMed Central"

You can also find these databases directly (w/o going through RPI) but one advantage of going through RPI is that when you look at the summary of a paper, you will sometimes see a "GetIt@RPI" button which you can hit and then it will tell you whether it is available online through the RPI library, and if so, you can access it directly w/o having to search for it separately.

Another good search engine for journal articles is of course
http://scholar.google.com/

I) Also, Wolfram Alpha has some useful quick-and-dirty mathematical (and other) capacities.

J) For those of you possibly interested in working on Problem D, (which may involve network science), you might find these two free software packages of interest:

Gephi
NetworkX (tutorial (PDF, python) by former participant and coach)

Also, here are some survey articles about network science:
http://eaton.math.rpi.edu/faculty/Kramer/MCM/NetworksReferences.zip

"The Structure and Dynamics of Networks" by Newman, Watts, Barabasi is available as an ebook via the Rensselaer library.

K) For problems involving geographical data: https://data.gov/

United Nations data and statistics,

An excellent beginners guide to Basemap (python map creation tool); further documentation

Street networks and geographic data (Jupyter notebook)

Mathematica has some useful databases, and you can see on stackexchange ways in which to visualize them:

http://mathematica.stackexchange.com/questions/11850/creating-a-weighted-directed-graph-from-ordered-triples/

L) If you are using MATLAB to make graphics, here is a note on how to get a more attractive white background on some figures:
http://eaton.math.rpi.edu/faculty/Kramer/MCM/whitebackground.pdf

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