The Middle Mathematical Contest in Modeling (MidMCM)

The High School Mathematical Contest in Modeling (HiMCM®)

The Consortium for Mathematics and Its Applications (COMAP)

COMAP Webinar Recording Policy

- COMAP is recording the webinar.
- We retain the right to show it again and to distribute it.
- By participating, you are agreeing that your contributions become part of the recording.

Webinar Agenda & Guidance

- Introduction
- HiMCM/MidMCM – Get Ready!
- HiMCM/MidMCM - Achieve Success!
- Example Problems
- Future Math Studies and Contests
- Questions – Please use the CHAT function on the bottom of your screen to send questions to the panelists. Panelists will answer questions at the end of the presentation.

Introductions

- **Panelists:**
  - Sol Garfunkel, Executive Director, COMAP
  - Kathi Snook, Director, HiMCM/MidMCM
  - John Tomicek, Contest Coordinator, COMAP

COMAP - Background

- **Mission:**
  - To improve mathematics education for students of all ages.
- **Founding:**
  - 1980 as a non-profit organization.
- **Curricular & Professional Development Materials:**
  - In print, video, and multimedia formats.
  - UMAP Journal, Consortium, Mathematics: Modeling Our World, GAIMME, BioMath, MathModels.org and more.

COMAP - Contests

- **International Modeling Contests:**
  - Encourage students to embrace the scientific method, sound modeling processes, and good problem-solving techniques.
  - **Mathematical Contest in Modeling** (MCM, 1985)
  - **Interdisciplinary Contest in Modeling** (ICM, 1999)
  - **High School Mathematical Contest in Modeling** (HiMCM, 1999)
  - **Middle School/Level Mathematical Contest in Modeling (MidMCM, 2021)**
  - **International Mathematical Modeling Challenge** (IMMC, 2015)

HiMCM/MidMCM – Get Ready!

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HiMCM/MidMCM – Get Ready!

- **Step 1: Form A Team**
  - A team shall consist of up to four (4) students from the same school.
    - **HiMCM:** High School Level or below.
    - **MidMCM:** All team members must be less than 14.5 years old at the start of the contest.
- **Step 2: Team Advisor**
  - The role of advisor can be filled by any faculty or staff member at your school.
  - The advisor does not have to be from the mathematics department.
  - The advisor will act as the main point of contact for the team.

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HiMCM/MidMCM – Get Ready!

- **Step 3: Review The Rules**
  - Visit www.himcmcontest.com or www.midmcm.com to review the Contest Rules and Instructions.
  - Download the **HiMCM/MidMCM: *Procedures and Tips for a Great Experience* Article.**

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HiMCM/MidMCM – Get Ready!

- **Step 4: Register**
  - The registration fee for HiMCM/MidMCM is $100 per team.
  - We accept payment via Credit Card, and payment must be made via our secure web site.
  - The registration fee can be paid by anyone (Parent, Teacher or Administrator).

HiMCM/MidMCM – Get Ready!

- **Step 5: Prepare**
  - Read some of the previous years' contest problems at www.himcmcontest.com.
  - Review some of the Outstanding papers from previous years at www.mathmodels.org.
  - Read the Spring HiMCM article in *Consortium* available on the contest webpage.

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Contest Dates and Times

- **Registration**
  - Deadline: 2:00pm EST Start Day of the Contest Window.
- **Contest Opens – Choose a Problem**
  - Problems go live the first day of the contest.
    - **HiMCM Teams**: Choose HiMCM **Problem A** or **Problem B**
    - **MidMCM Teams**: Choose MidMCM **Problem C** (or choose to compete in HiMCM by choosing Problem A or Problem B)
- **Contest Window**
  - 2 weeks in November.
  - Teams work on days and times that fit their schedules.
  - Teams may work remotely.

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Contest Dates and Times

- **Solution Report**
  - PDF document.
  - Deadline: 9:00 pm EST on the Last Day of Contest Window.
- **LOGIN** to the contest web site using the Advisor Login link to verify that your team's Electronic Solution was received at COMAP.
- **Contest Results**
  - The results will be posted on or before February 1 each year.

Contest Designations

- **Designations** are based on the papers submitted.
- **Honorable Mention** indicates an above average effort in addressing all problem requirements, and shows sound and supported processes in modeling, problem solving, analysis, conclusions, and communication.
- **Meritorious** reports are excellent in many aspects of modeling and problem solving, analysis, conclusions, and communication. The report addressed all requirements in a clear, well-supported, well-organized, and well-presented manner.
- **Finalist** recognizes teams whose solution reports are exemplary and therefore reached the final round of judging. These papers present complete and logical analysis in an organized and clear presentation beyond simply addressing the requirements.
- **Outstanding** designates the "Best of the Best." These reports are at the highest level relative to the contest submissions in terms of exemplary student work in modeling, problem solving, analysis, and communication.
    - **NCTM Awards**
        - HiMCM: One award for Problem A and one award for Problem B.
        - MidMCM: One award for Problem C.

HiMCM – Achieving Success

- **Resources for Preparation** – at **www.COMAP.com**
  - ***Procedures and Tips for a Great Experience***
  - Spring article from ***Consortium*** – The HiMCM Issue.

- **Elements of a Competitive Solution Paper**
  - Overall Submission
  - Executive Summary and Introduction
  - Assumptions with Justifications
  - The Model Development and Application to the Problem
  - Strengths and Limitations, Sensitivity Analysis
  - Conclusion

Overall Submission

- **Follow the Contest Rules**
  - Number of pages and type font
  - No names of school or students
- **Presentation**
  - Coherent, Organized, Articulate, Well-Written
- **Complete all problem requirements**
- **Communicate the solution clearly**
- **Citations and References**

Executive Summary and Introduction

- **Executive Summary:** 3-5 paragraphs
  - Restate the problem and requirements in your own words.
  - Provide a short description of your method.
  - Report your major findings (answers to the requirements).
  - State your conclusions.

- **A Table of Contents** is appropriate and helpful.

- **Introduction**
  - Provide a brief background and restatement of the problem.
  - Provide a preview of your solution.

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Assumptions with Justifications

- We make **assumptions** in our modeling processes in order to simplify the complexities of a problem.
- Each assumption you make should directly impact your modeling process and solution.
- Accompany each assumption with a justification to show the assumption is reasonable and necessary.

- **Example** – Model the electricity used in charging personal electronic devices in a school building.
  - **Assumption**: All students are in the school building an average of 7 hours per day from Monday to Friday.
  - **Justification**: My school starts at 7:30am and ends at 3:00pm, but some students might be absent and others leave for appointments for short times during the day.

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Model Development and Application

- **Define your variables**
  - Remind the reader of the meaning of your variables as you use them.
  - Use appropriate units and ensure unit consistency.
- **Model Development**
  - Logically present the process of your model development.
  - Do not present multiple models.
  - Present your final model in full form.
- **Clearly state your model's results**
- **Be Creative** in your solution processes and your presentation.

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Strengths and Limitations

- **Evaluate your model and results**
  - Strengths – What is good about your model? What makes it reasonable and the results realistic?
  - Limitations – What is a weakness of your model? How might your model be improved? Is there future research to do?
- **Validate your model**
  - Apply your model using a numerical example or intuition.
- **Sensitivity Analysis**
  - How sensitive are your results to changes in variable inputs or constant values?
  - How sensitive are your results to changes in your assumptions?

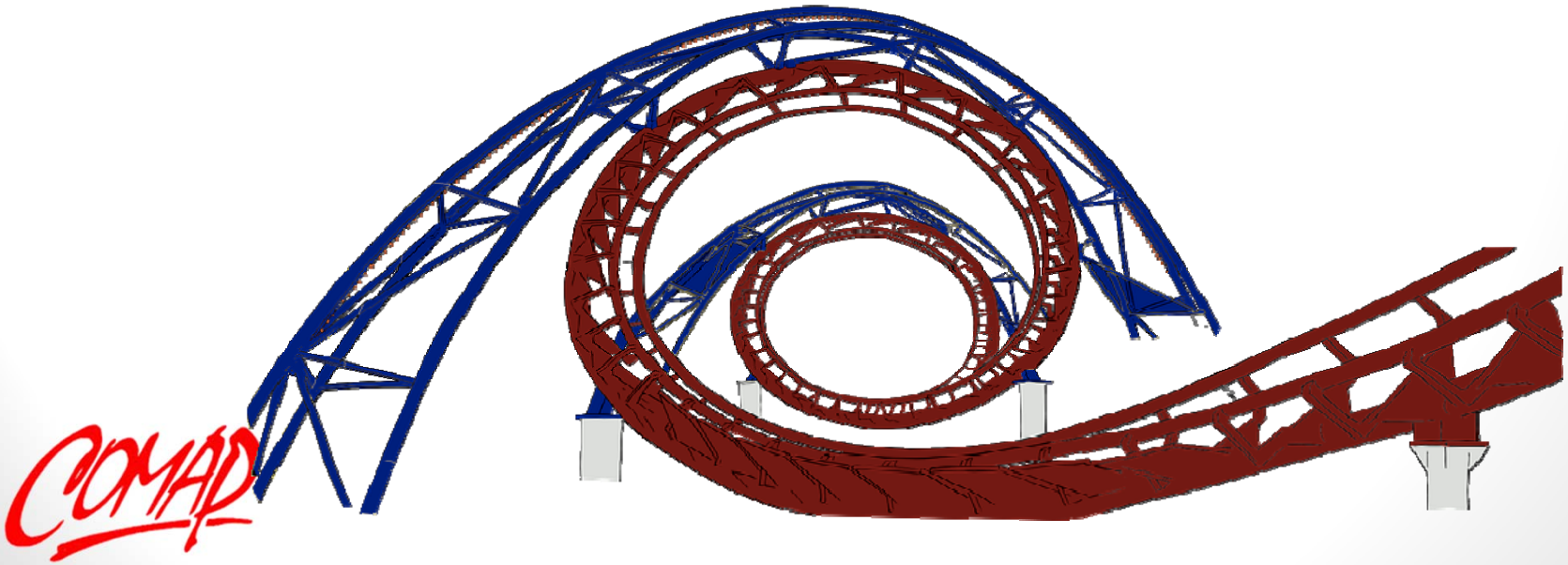
Conclusion

- **Conclusion**
  - Ensure you have answered all requirements of the problem and summarize your results.

- **Citations and References**
  - Cite all sources at the point you use them in your paper using in-line documentation or footnotes or endnotes.
  - All data, figures, graphs, images, and tables that come from outside sources require documentation.
  - Include a Reference List or Bibliography at the end of your solution.

Example HiMCM Problem: Roller Coasters

- There are many on-line Roller Coaster rating/ranking systems that take subjective rider input into account.
- Create a purely objective and quantitative algorithm to develop a roller coaster rating/ranking system.
- Develop your “Top 10 in The World” roller coaster list.



Example Problems HiMCM

- **2017 HiMCM**
  - *Drone Clusters as Sky Light Displays* Design an aerial outdoor light show using drones.
- **2018 HiMCM**
  - *Cozy Smart Home* Model a potential next generation smart home climate control system.
- **2019 HiMCM**
  - *Bottle Battles* What are the impacts of a ban on single serving water bottles?
- **2020 HiMCM**
  - *Funding Biodiversity Conservation* Determine how to efficiently invest in biodiversity conservation projects for endangered and threatened species.

MidMCM – Example problem posted by October 1st at www.mathmodels.org.

Future Math Study & Contests

- **MidMCM**
  - The only requirement is Middle School/Level mathematics.
  - Examples: Equations/Inequalities, Fractions/Percents, Proportions, Pre-Algebra.
- **HiMCM**
  - The only requirement is High School mathematics.
  - Examples: Algebra, Geometry, Pre-Calculus, Descriptive Statistics.
- **Undergraduate Contests**
  - Mathematical Contest in Modeling (MCM)
  - Interdisciplinary Contest in Modeling (ICM)
- **Skills** for Undergraduates
  - Math, Science, Engineering, Technology, and more.
  - Contest participants come from across many departments.
  - Advisors from many departments.

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Articles, resources, and links for your contest preparation

- Visit www.himcmcontest.com and www.midmcm.com to review the contest rules, procedures, and to register your teams.
- COMAP also offers a wealth of FREE teaching resources for levels and disciplines. See www.comap.com.

MATHmodels.org

- Powered by COMAP content, MATHmodels.org has been reimagined as a new resource to make math modeling a year-round activity. Teachers and students may use the materials found on this site to enrich their classes. On the site you will find a complete list of problems, solutions and articles to prepare students for mathematical modeling competitions. Visit www.mathmodels.org.

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Twitter, Weibo, and HiMCM/MidMCM Webinar Webpage

- For the most up-to-date information about COMAP and our mathematical contests.
  - Follow us on Twitter **@COMAPMath**.
  - Follow us on Weibo at **COMAPCHINAOFFICIAL**
  - or Reach us by email at info@comap.com.

- Visit the COMAP HiMCM/MidMCM Webinar webpage at MathModels.org to download the materials discussed during this webinar.

Questions / Discussion

Please enter your questions into the Chat.

Contact Information

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Thank you for attending the COMAP HiMCM/MidMCM Webinar