

2024 IM²C Global Sports League



Background

Fair competition in sports requires a balance of logistics, equity, and practicality, especially when organizing sporting competitions on an international scale. The International Multi-Continental Matchmaking Committee (IMMC) seeks your expertise to develop a scheduling system for their upcoming Global Sports League (GSL). This league will feature teams from around the world, emphasizing geographic diversity, competitive equity, and logistical feasibility. The IMMC also values economic and environmental sustainability, wants to ensure fair matchups and requires the league to include 20 teams with at least two teams from each continent (excluding Antarctica). The GSL season runs between 8 and 9 months.

While the IMMC has outlined key criteria for the league, they have not yet determined the sport to be played in the GSL. Some sports already have an established international presence, while others have limited global reach. The IMMC is open to considering any **team sport**, provided your team can demonstrate its potential for global expansion within the GSL framework. This is where your expertise is needed.

Your team is invited to select a sport you are passionate about, develop a model that produces a fair and effective schedule for the GSL, and test how well your scheduling model adapts to changes in the league.

Requirements

1. Identify key factors
 - a. What is the sport? The GSL is a **team sport** competition (see Glossary for details).
 - b. Who are the teams and where are they located? Identify 20 teams to participate, ensuring at least two teams represent each continent (excluding Antarctica). Clearly explain the criteria used to select these teams.

- c. What aspects need to be considered when building a league schedule? The IMMC expects the schedule to consider travel distance, the number of games played and equitable matchups, but they are unsure of other components that may be of importance. Identify any additional key components that should be considered when developing a fair GSL schedule and discuss trade-offs involved in balancing these factors.

2. Develop the initial schedule

Build a mathematical model to construct a fair and practical schedule for the 20 team GSL. At the very least, ensure your scheduling model accounts for

- o Fair distribution of games across teams,
- o Equitable travel time and distance,
- o Balanced competitiveness of matchups.

Use your model to create a full season league schedule for your selected sport and provide evidence that demonstrates how it achieves IMMC goals of fairness, sustainability, and geographic representation. Additionally, determine the number of games each team must play to reasonably declare a league winner at the conclusion of the season.

3. Expand the GSL and extend the model

- a. Add four teams to the Global Sports League. Clearly explain the criteria used to select these teams.
- b. Evaluate how this expansion impacts the league schedule. Make sure to address fairness, sustainability, and geographic representation.
- c. Assess how the addition of four teams impacts the number of games that need to be played by each team in order to reasonably declare a league winner.
- d. Analyze how changes to key constraints (e.g., travel distances, change in home location of a team, number of league games) impact your model.

4. Generalize the model

In two pages or less, discuss how one could adapt your model to different team sports with distinct rules, game lengths, and team dynamics.

5. Communicate your solution to a non-technical audience

- a. Write a one-page letter to the IMMC summarizing your findings. In your letter, explain how your model aligns with the IMMC's goals for the league. Ensure your explanation is accessible to a non-technical audience.
- b. Provide a **visual graphic** of the initial 20-team GSL schedule on a separate page.

Your PDF submission should consist of:

- One-page Summary Sheet.
- One-page Table of Contents.
- One-page *Letter to the Decision Makers* with your recommendation (as noted in question 5a).

Write a one-page letter to the IMMC summarizing your findings. In your letter, explain how your model aligns with the IMMC's goals for the league. Ensure your explanation is accessible to a non-technical audience.

- One-page Visual Graphics of the initial 20-team GSL schedule (as noted in question 5b).
- Your complete solution. Twenty pages (maximum) communicating essential aspects of your solution.
- Reference List.
- [AI Use Report](#) (if used).
- The following items do not count towards the 24-page limit: Reference List and Appendices (including [AI Use Report](#)).

Note: There is no specific required minimum page length for a complete IM²C submission. We permit the careful use of AI such as ChatGPT, although it is not necessary to create a solution to this problem. If you choose to utilize a generative AI, you must follow the [IM²C AI use policy](#). This will result in an additional AI use report that you must add to the end of your PDF solution file and does not count toward the 24 total page limit for your solution.

Your PDF submission paper must be typed and in English using A4, margins at least 1.5cm (OR) Letter, margins at least 0.6in with at least 12-point font size. For detailed information about IM²C submission guidelines and the general expectations for each portion of your solution please review the [Full Submission Guidelines](#).

Glossary

A **team sport** is a sport in which multiple players collaborate to achieve a common objective, ultimately leading to victory in a game or match. To qualify for potential inclusion in the GSL, the sport must require a minimum of five players per team actively participating on the field, court, or playing area at all times throughout the match.

Examples of eligible sports (non-exhaustive): football (soccer), basketball, cricket, rugby, American football, volleyball, handball, water polo, and lacrosse.

A **visual graphic** is a visual representation of information, data, or ideas, typically combining images, text, and design elements to communicate a message effectively.

2025 IM²C Full Submission Guidelines

Teams may use any inanimate source of data, materials, computers, software, references, websites, books, etc. Be sure to credit all sources used.

Teams may not use any person (other than team members) to discuss or obtain ideas for solving their problem **nor may they seek help in obtaining an answer from the teams' advisor or anyone else**. Any team that discusses the problem with anyone in a position to supply them with information reflecting experience or professional expertise will be disqualified. The relevant issue is one of intent: each team of students is expected to develop all of its substantive analysis without the help of others.

Partial solutions are acceptable. There is no passing or failing cutoff score, nor will numerical scores be assigned. The IM²C judges are primarily interested in a teams' approach and methods.

The solution must consist entirely of written text and possibly figures, charts, or other written material only. No non paper support such as computer disks or applications will be accepted.

Each page of the solution should contain the team control number and the page number at the top of the page; we suggest using a page header on each page for example: Team # 2024000 page 6 of 13.

The names of the students, advisor, or institution must not appear on any page of the solution. The solution must not contain any identifying information other than the team Control Number.

Teams should keep in mind the following guidelines while preparing their solution papers:

- Conciseness and organization are extremely important. Key statements should present major ideas and results.
- Present a clarification or restatement of the problem as appropriate.
- Present a clear exposition of all variables, assumptions, and hypotheses.
- Present an analysis of the problem, motivating or justifying the modeling to be used.
- Include a design of the model. Discuss how the model could be tested.
- Discuss any apparent strengths or weaknesses to your model or approach.
- Incorporate lengthy derivations, computations, or illustrative examples in appendices. Summarize these in the main report. Results must be explicitly stated in the body of the report.

Your PDF solution should include:

- **One page Summary Sheet.**

The Audience for the summary sheet is anyone unfamiliar with the problem. Hence, in your own words briefly outline the problem, the main solution approach, and your conclusion.

Compliance: Failure to meet these specifications or attempts to circumvent them may result in a lower designation or disqualification.

- **Reference List, Appendices, and AI Use Report.**

A list of references, any appendices, and the AI Use Report, **do not count** toward the 24-page limit and should appear after your completed solution. You should not make use of unauthorized images and materials whose use is restricted by copyright laws. Ensure you cite the sources of all ideas and materials (data, images, etc.) so it is clear to the reader what ideas and mathematical work was completed by your team and where you are building in ideas of others.