



## 6<sup>th</sup> International Mathematical Modeling Challenge

### IM<sup>2</sup>C 2020 Instructions and Rules

To participate in the International Mathematical Modeling Challenge (IMMC or IM<sup>2</sup>C), all team members must be coming from the same school. There are several steps that a team advisor must go through before, during and after the contest. Please read this instructions and rules document carefully and ensure to complete all the procedures involved. It is the teacher advisor's responsibility to make sure that the team will follow all steps required for participation in IM<sup>2</sup>C.

#### Contest Rules

1. A team may consist of 2-4 secondary school students, enrolled in the same school. There must be at least 1 faculty teacher from that school as an advisor. There is no limit of the number of participating teams from one school.
2. Participating teams in IM<sup>2</sup>C from all over the world will be selected by a national/regional selection process before they enter the IM<sup>2</sup>C International Round. Teams from Mainland, Taiwan, Hong Kong and Macau of China will firstly be selected from the IM<sup>2</sup>C Greater China Round.

The International Mathematical Modeling Challenge (Zhonghua) Committee, a non-profit and charitable institution of public character incorporated in Hong Kong SAR (charity certificate no. 91/14657), is authorized exclusively by the organizer of IM<sup>2</sup>C for the adjudication, team selection, recognition of awards and other academic affairs in Greater China region. The Academic/Advisory Committee and Expert Panel established by the organizer are composed of leading academics and experts from well-known universities, research institutions and industries.

In order to cater for the diversity in school calendar across Greater China region, there are two alternative contest seasons (autumn and winter) for the Greater China Round. Team can participate in either or both seasons of contest, the team's best result will be used to compete in the Greater China finalist award recognition and be qualified for the International Round.

Participating teams from Greater China region can choose: 1) to work on a problem created by the Problem Setting Committee of IM<sup>2</sup>C Greater China; 2) alternatively, register for a self-challenging problem, i.e., the team can choose freely a problem set by the team members themselves. Note that such problem must be a real-world problem defined by the team.

3. Teams who work on the *Committee-Set-Problem* must complete and submit the solution paper within 96 consecutive hours (4 days) at the assigned period of time. Teams working on the *Self-Chosen Problem* can decide on their own about the starting time and schedule; however, they must complete and submit their solution

paper of modeling on or before the deadline of the seasonal contest in Greater China. Solution papers of the two categories will be judged separately. Teams whose papers are judged as among the top 20% of the two categories of papers respectively will automatically proceed to the International Round of IM<sup>2</sup>C 2020.

4. Registration process, downloading problem/control sheet and uploading papers/materials for participation in Greater China should be performed on the online contest system: [www.immchallenge.org.hk](http://www.immchallenge.org.hk). Teams who participate first time have to sign up to the system to create their account with username (valid email address) and password. By logging in with the email address and password, the team can register for the ongoing contest under the “Event” column. Successful registration will grant the team a Control Number for the chosen contest. (Note: Signatures of parents/guardians is not required on the control sheet; but their names must be filled. The teacher advisor is required to sign off the control sheet with authorization by and on behalf of parents/guardians.)
5. The registration fee for IM<sup>2</sup>C 2020 Greater China is US\$ 55 per team, for either Greater China Committee-set problem or freely-chosen problem. If the team needs an individual review report of their solution paper, they should pay extra US\$50 when registering. The fees are used for cost sharing and non-profit purpose only. The International Round is free of charge.
6. Teams who choose *Committee-Set-Problem* can start at 8:00 p.m. on Thursday 21 November 2019 (GMT/UTC +8 time zone) for the Greater China autumn contest; and/or 8:00 p.m. on Thursday 16 January 2020 (GMT/UTC +8 time zone) for the Greater China winter contest. Teams must complete and submit a solution paper on the problem within the consecutive 96 hours. For the teams who choose *Self-Chosen Problem*, they can decide the starting time and the work schedule by themselves. All teams (of both *Committee-Set-Problem* and *Self-Chosen Problem*) must submit their papers on or before the deadline - 8:00 p.m. on Monday 25 November 2019 (GMT/UTC +8 time zone) of Greater China autumn contest; 8:00 p.m. on Monday 20 January 2020 (GMT/UTC +8 time zone) of Greater China winter contest.
7. The IM<sup>2</sup>C 2020 International Round for Greater China region will be held between 8:00 p.m. on Tuesday 10 March 2020 (GMT/UTC +8 time zone) and 8:00 p.m. on Sunday 15 March 2020 (GMT/UTC +8 time zone). The participating teams must complete and submit a solution paper on the problem created by the IM<sup>2</sup>C International Expert Panel within consecutive 120 hours. Team must complete the contest at the end of the 5<sup>th</sup> consecutive day.
8. Contest problems can be downloaded by logging into the IM<sup>2</sup>C Greater China contest system since the start of the competition.
9. Team advisors must ensure that there should have no any change made after the end of the contest (no later than 8:00 p.m. on 25 November 2019 for the Greater China autumn contest; no later than 8:00 p.m. on 20 January 2020 for the Greater China winter contest; no later than 8:00 p.m. on 15 March 2020 for the International Round contest).

The advisor is responsible for collection of the solution paper from the participating team and upload the paper (in PDF format) and control sheet to the IM<sup>2</sup>C Greater China contest system for the regional Expert Panel to review. Only submit one paper from the team for each upload.

**The names of the students, advisor or school must not appear on any page of the solution. The paper must not contain any identifying information other than the team control number. The first page of the paper should be the summary of the paper.**

10. The deadline of paper submission: no later than 8:00 p.m. on 25 November 2019 (GMT/UTC +8 time zone) for the Greater China autumn contest; no later than 8:00 p.m. on 20 January 2020 (GMT/UTC +8 time zone) for the Greater China winter contest; no later than 8:00 p.m. on 15 March 2020 (GMT/UTC +8 time zone) for the International Round contest.
11. Each student must sign the control sheet, pledging that they have abided by the contest rules and instructions. The advisor must also obtain the consent from their parents/guardians of each student so that advisor can sign the control sheet on behalf of them. The advisor must upload the signed control sheet to the contest system in PDF or jpeg/png format along with the paper submission.
12. School should address students' learning and living needs due to the participation in the IM<sup>2</sup>C contest. All accommodations relative to learning conditions for individual students would follow the accommodations used as part of the local school program in an affected student's daily learning. If specialized staff is required by local regulation and law, the school bears the responsibility for providing any specialized assistance as required by law or regulation.

### **Please Keep Connected Online**

Each participating team will receive a control number via system email after successfully registering the contest. The control number is the only identity of the team for each contest/activity and the paper submitted.

**IMPORTANT!** Please make sure that you register with a **VALID** email address so that we can reach you at any point before, during and after the contest, if necessary.

### **Preparing a Team**

1. Please read the IM<sup>2</sup>C Instructions and Rules document carefully before joining the competition. For more information and sample problems of the contest, please visit [immchallenge.org.cn](http://immchallenge.org.cn), [immchallenge.org.hk](http://immchallenge.org.hk) or [immchallenge.org](http://immchallenge.org). Providing the necessary training and coaching for students before the contest is allowed and beneficial.
2. Ensure that students have access to computers that enable them to word process, use a spreadsheet and relevant software, and dynamically compute and model both graphs and geometric relationships. In addition, students should have access to graphing calculators.
3. The advisor is required to obtain the consent from parents/guardians of all students of the participating team and sign on the control sheet on behalf of them. By signing the

form, parents/guardians agree their child's work are available (with confidentiality assurance) for use as model paper and training materials for IM<sup>2</sup>C professional development activities. Additionally, should their team be designated as an Outstanding or other award winner, the student's solution paper (or solution abstract) will be published. Signed form should be submitted in PDF or jpeg/png format along with the solution paper for review by the Expert Panel judges.

### **Preparing a Solution Paper**

1. When teams are ready for the contest, the team advisors may login to the IM<sup>2</sup>C Greater China website after the starting time to download the problem and distribute it to the team. The problem of IM<sup>2</sup>C 2020 (Great China Round) for *Committee-Set Problem* will be released at 8:00 p.m. on 21 November 2019 for Greater China autumn contest and 8:00 p.m. on 16 January 2020 for Greater China winter contest on the IM<sup>2</sup>C Greater China contest website. For teams who choose *Self-Chosen Problem*, they can decide the start date and the work schedule by themselves, but need to submit their solution paper before the deadline of the contest. The IM<sup>2</sup>C International Round will start at 8:00 p.m. on 10 March 2020 and by the same time, the problem can be downloaded from the IM<sup>2</sup>C Greater China website
2. Teams may use any inanimate source of data, materials, computers, software, references, websites, books, etc. However, all sources must be credited properly in the paper.
3. Whether teams choose *Committee-Set Problem* or *Self-Chosen Problem*, they 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.
4. Partial solutions are acceptable. There is no passing or failing cut-off score, nor will numerical scores be assigned. The judges are primarily interested in a teams' approach and methods and also how the team defines a problem and solves the problem (especially for *Self-Chosen Problem*).
5. For the IM<sup>2</sup>C (Greater China Round and International Round), teams can submit the paper and deliver finalist presentation in English or Chinese. However, papers submitted to the International Expert Panel via the International Round must be in English or translated into English. Papers must be typed and in English. That means, if a paper in Chinese is selected by the Greater China Expert Panel and will represent the region to join the international judging, the paper must have been translated into English. Note: Teams from Mainland, Taiwan, Hong Kong and Macau of China can submit papers in Chinese at the International Round on 15 March 17 2020, but papers selected for review by the International Expert Panel must be submitted in English translation on or before 3 May 2020. The teacher advisor must ensure that any translation is of the actual paper submitted, i.e. no changes have been made during the

time it takes to translate the paper. The translation must be a word for word translation and no improvements may be made.

6. The paper you submit should include a one-page summary sheet which should be the first page of your solution paper. Your full solution should be no more than 21 pages (with summary page, excluding appendices and references). The summary is a very important part of your paper. The judges place considerable weight on the summary; the winning papers are always distinguished from other papers based on the quality of the summary. A summary is a first step for judges to decide whether they will continue the reading of the paper. Thus, a summary should clearly describe your approach to address the problem and, most prominently and what your most important conclusions were. Your concise presentation of the summary should inspire a reader to learn the details of your work. Summaries that are mere restatements of the contest problem, or are a cut-and-paste boilerplate from the introduction are generally considered to be weak.
7. The solution must consist entirely of written text and possibly figures, charts, or other written material only. Supporting materials such as computer disks will not be accepted except that materials such as computer program are required specifically and clearly.
8. Each page of the solution paper must contain the team's Control Number and the page number at the top of the page; we suggest using a page header on each page for example: Team # IMMC20010101 page 8 of 18.
9. **The names of the students, advisor, or school/institution must not appear on any page of the solution. The solution must not contain any identifying information except the team control number.**
10. Any rule not followed is ground for disqualification.
11. 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.
  - For *Committee-Set Problem*, you should present a clarification or restatement of the problem as appropriate in your paper. For *Self-Chosen Problem*, it is required to state the problem and background that it is extended, improved or deepened on the basis of the literature and research by others; or define clearly the problem that is originally identified by the team.
  - Present a clear exposition of all variables, assumptions, and hypotheses.
  - Present an analysis of the problem, motivating or justifying the modelling 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.

### **Submitting a Solution Paper**

1. Teams must end all work on the solution paper by 8:00 p.m. (GMT/UTC +8 time zones) on 25 November 2019 for Greater China autumn contest; 8:00 p.m. (GMT/UTC +8 time zones) on 20 January 2020 for Greater China winter contest, and 8:00 p.m. (GMT/UTC +8 time zones) on 15 March 2020 for International Round.
2. Submit paper via IM<sup>2</sup>C Greater China contest website:
  - 2.1. All teams are required to submit electronic copy of the solution papers and completed control sheets through the Greater China Regional contest system.
    - (1). Submissions must be completed by 8:00 p.m. (GMT/UTC +8 time zones) on 25 November 2019 for Greater China autumn contest; 8:00 p.m. (GMT/UTC +8 time zones) on 20 January 2020 for Greater China winter contest and 8:00 p.m. (GMT/UTC +8 time zones) on 15 March 2020 for International Round.
    - (2). Failure in completion of submission before the deadline above will result in automatic disqualification in related contest.
    - (3). If the solution paper submitted to the International Round is in Chinese and is selected to proceed for International Expert Panel's review, the corresponding team is required to translate the paper into English and submit the English paper by 3 May 2020. The content in the English and Chinese versions should be the same; team shall not make any further modifications, enhancements, additions or improvements of the content. Papers in Chinese and English will be cross-checked for the consistency; any changes of content will cause disqualification of the contest.
  - 2.2. Name your solution paper and control sheet with your team's Control Number only.
  - 2.3. IM<sup>2</sup>C will accept only an PDF file as the paper. Document size should be **less than 17MB**. DO NOT include programs or software with your file as they will not be used in the judging process except that it is required specifically. The names of the students, advisor or institution should not appear on any page of the electronic solution. Page 1 of the electronic solution paper should be the summary.
3. The advisor shall ensure that each member of the team (including the advisor) signs the control sheet, pledging that they have abided by the contest rules and instructions.

### Summary of submission:

1. Solution Paper:
  - Restatement Clarification of the Problem - state in your own words what you are going to do;
  - Assumptions with Rationale/Justification - emphasize those assumptions that bear on the problem;
  - List clearly all variables used in your model;
  - Model Design and Justification for type model used/developed;
  - Model Testing and Sensitivity Analysis, including error analysis, etc.;
  - Discuss strengths and weakness to your model or approach;

- Provide algorithms in words, figures, or flow charts (as a step by step algorithmic approach) for all computer codes developed.
2. The electronic file of the paper should be submitted via the Greater China Regional contest system ([immchallenge.org.cn](http://immchallenge.org.cn) or [immchallenge.org.hk](http://immchallenge.org.hk)). See point 2 in the “Submitting a Solution Paper” section.
  3. The first page of the solution paper should be a summary page. Solution paper and control sheet should be submitted in this order: control sheet; solution paper (including the summary page).
  4. The advisor must obtain the consent from parents/guardians of all students of the participating team and sign the control sheet on behalf of parents/guardians. The signed control sheet should be submitted to the contest system in PDF format or photo format (jpeg or png format) along with the solution paper.

### **IM<sup>2</sup>C2020 Finalist Presentation, Summit and Award Ceremony**

1. The participating teams from Greater China region will have the chance to be recognised with different awards at both regional and international levels. Each team will have the opportunity to obtain regional and international awards including Outstanding, Finalist, Meritorious, Honourable Mention and Successful Participant.
2. IM<sup>2</sup>C is fair for each participating team and student. Paper of *Committee-Set Problem* and *Self-Chosen Problem* in Greater China Round and *Problem* in International Round will be judged separately. All papers will have a chance to be recognised with awards for regional and international contest in the Greater China region.
3. For both Greater China Round and International Round, selected teams will be invited by the organizer to proceed to the Finalist Presentation to be held in Hong Kong on 24-25 April 2020. Selected team for Greater China Round and International Round will be judged in front of the Grand Jury of Greater China, respectively.
4. The best two papers from each area (Mainland, Taiwan, Hong Kong and Macau) in the International Round (totally 8 papers) will be selected by the IM<sup>2</sup>C Committee Greater China for recommendation to the International Expert Panel. (Other participating country/region will select the best two papers too for the International Panel’s Judgement. The final judging by the International Expert Panel will be completed in June 2020. The selected solutions will be recognized as Successful Participant, Honourable Mention, Meritorious, or Outstanding.
5. The results of the Greater China Round and International Round Competition will be announced on the IM<sup>2</sup>C website. News release on the results of the contest will be published in local and international media and publications.
6. The outstanding paper (or summary) from Greater China region and International Round will have the opportunity to be published. Recognition information will also be sent to local and international newspapers and radio/television outlets.
7. The IM<sup>2</sup>C 2020 Greater China Region Awards Ceremony will be held at the IM<sup>2</sup>C Summit cum Summer Workshops in Hong Kong in the summer of 2020. Greater China teams who are recognised with Outstanding award in the Great China Round or/and International Round will be invited to deliver Plenary Speech in the Ceremony. The Outstanding winners in the International Final Judgement (or the Global Top5

Teams) will also be invited to attend the International Awards Ceremony at the 14<sup>th</sup> International Congress on Mathematical Education (ICME-14, [www.icme14.org](http://www.icme14.org)) in Shanghai, China.

8. If the award-winning team wish to publish their award-winning paper outside IM<sup>2</sup>C platforms, the team should first inform IM<sup>2</sup>C and obtain consent from the IM<sup>2</sup>C.
9. Teams attending the Finalist Presentation are responsible for all of their expenses of transportation and accommodation. IM<sup>2</sup>C organizer will cover the transportation and accommodation expenses for Outstanding winner teams from International Final Judgement to attend the International Awards Ceremony and events.
10. Please note that if you need to apply for a Hong Kong visa, your passport needs to be valid for 6 months beyond the intended period of stay.

### **IM<sup>2</sup>C 2020 Schedule**

The schedule of the 6<sup>th</sup> International Mathematical Modelling Challenge (IM<sup>2</sup>C 2020) in the Greater China region is as follows:

Registration	Deadline is 21 November 2019 (Autumn Contest) 25 November 2019 to 16 January 2020 (Winter Contest)
The Greater China Round	21 November to 25 November 2019 (Autumn Contest) (25 November 2019 is also the deadline for submission of <i>Self-Chosen Problem</i> paper) 16 January to 20 January 2020 (Winter Contest) (20 January 2020 is also the deadline for submission of <i>Self-Chosen Problem</i> paper)
International Round	10 March to 15 March 2020
Finalist Presentation	24-25 April 2020, Hong Kong
IM <sup>2</sup> C Summit cum Summer Workshops and International Awards Ceremony	July 2020, Hong Kong / Greater Bay Area- Shanghai