



SCORING GUIDELINES

Teams should:

- Use mathematical models **either developed originally or discovered through research**.
- **Demonstrate a depth of understanding** of their solution.
- Provide **additional insight** if their solution is drawn from sources.

For each of questions 1 through 3, teams should **create a mathematical model**, which means:

- Define all variables and parameters (with units).
- Justify assumptions.
- Describe the mathematical approach(es) used in the model.
- Apply to or demonstrate for any situations presented.
- Discuss implications of the result(s).

More guidance on the various parts of the problem:

Solution Component	Considerations	Value
Executive Summary	<ul style="list-style-type: none"> • Overview of the problem (all three parts). • Brief description of the mathematical approaches that will be used. • Provide and discuss a summary of the results (even if they are incorrect). 	Up to 20%
Question 1	<ul style="list-style-type: none"> • An accessible entry point to a larger problem. • A warm-up—it is anticipated that most teams will develop a solution for this question. 	Up to 20%
Question 2	<ul style="list-style-type: none"> • Investigation of essential issues underlying this real-world problem. • The main event—every team can have some success and many teams will cover it well. 	Up to 25%
Question 3	<ul style="list-style-type: none"> • A challenging aspect; requires broader and/or deeper perspective. • The discriminator—many teams will do something, while only a few will have striking results. 	Up to 15%
Discretionary points	<ul style="list-style-type: none"> • Team examined a wider set of circumstances. • Team used a creative problem solving perspective. • Team made connections between all three parts and the overall driving question. • Paper is exceptionally well written/organized. • Detailed sensitivity analysis is presented. • Model verification is performed. • Strengths and weaknesses are addressed. • Effective and well-motivated use of technical computing. 	Up to 20%

More on reverse

Other considerations

Basic Modeling and Writing Concerns:

- Check that the units are consistent.
- All figures and graphs should have a title, a label, a caption, and the axes should be labelled.
- All tables should have a title, a header, a label, and a caption.
- All variables and parameters should be clearly defined.
- Motivate and fully explain the use of any complicated mathematical expressions.
- When citing outside sources, clearly explain what statistics, models, equations, or insights you took from each source.

Clearly insincere or disrespectful submissions should receive a total score of 0 (zero) and do not receive certificates of participation.

Comments from judges for teams are highly encouraged and are emailed to teams after triage judging concludes. Keep in mind that judges may be brief and/or relay unanswered questions they had about a team's work.

The Technical Computing Scholarship Award

If a team chooses to solve one or more parts of the challenge using a programming platform (specifically something other than a spreadsheet), they will be eligible for the Technical Computing Award. Solutions that receive the award must demonstrate an outstanding use of computing to advance the team's model or to reveal its implications (including via advanced model and data visualization).

Teams must discuss any use of programming in the paper:

- Teams should justify the use of technical computing. That is, it must be clear why the team leveraged a computer program instead of just a calculator.
- Teams should include a summary of the purpose and key features of their code.
- If an outside library or method is used in a black-box way, it should be clear that the team understands the method's functionality, and can justify why it was chosen.

Given the time constraints of the competition, judges do not expect perfectly formatted or commented code. However, some code commenting, meaningful variable names, and appropriate use of functions and code-reuse will make it easier for judges to understand what a program is doing and how it contributes to the teams model.¹

If you want to be considered for the Technical Computing Award, please title your code appendix with the following to make sure your code is read: "Code for Technical Computing Award Consideration."

¹See Appendix B of the handbook *Math Modeling: Computing & Communicating* for examples.