

VEHICLE DESIGN
Divisions B & C
Virginia Trial Event

1. **DESCRIPTION:** Teams write a proposal as if they were going to create a Mousetrap or Gravity Vehicle and then answer questions from the Event Supervisors about their proposal.

A TEAM OF UP TO: 2

APPROXIMATE TIME: 5 minutes

2. **EVENT PARAMETERS:**

- a. Each team will write a proposal to build a Mousetrap (Division B) or Gravity (Division C) Vehicle, including the Ramp for the latter, and submit it as a single PDF file in advance of each competition. Details for how and when to submit the file must be released well ahead of each competition.
- b. The proposal may be no longer than 6 pages in Division B and 8 pages in Division C, excluding the budget section in rule 2.d.viii., which has no page limit. If the proposal, excluding the budget section, is too long, Event Supervisors will stop reading at the page limit.
- c. The proposal must include enough information (i.e., device dimensions) for the Event Supervisors to determine that the proposed device would not incur a construction violation according to the Mousetrap or Gravity Vehicle rules.
- d. The proposal will be scored on the following areas, where each area is worth the specified number of points:
 - i. [1 point] Identifying information: school/team name, team number, student names, title
 - ii. [10 points] Evaluation of the problem: scoring incentives and constraints in Mousetrap or Gravity Vehicle rules, implicit constraints (i.e., cost, build time), mathematical analysis where appropriate
 - iii. [8 points] **Division C Only:** Background research which explores important scientific concepts underlying a Gravity Vehicle, information supports the rest of the proposal
 - iv. [20 points] Design specification: all information needed to build the device, description of how it is run within the competition setting, verification that all construction parameters are met
 - v. [23 points] Design rationale: analysis that supports all significant aspects of chosen design, evaluation of trade-offs, mathematical analysis where appropriate, uses ideas presented in previous sections
 - vi. [8 points] Plan for testing and calibration: explanation of what data/observations are needed, procedure to acquire data/observations, how data/observations will be used
 - vii. [3 points] **Division C only:** References to include where appropriate, consistent style throughout document, appropriate style chosen
 - viii. [8 points] Budget: complete itemized list of parts and materials, includes testing equipment, line items have a clear or explained purpose, reasonable estimates and precise costs used where appropriate
 - ix. [5 points] Figures: included where appropriate, easily decipherable, properly labeled, complement the text of the proposal
 - x. [5 points] Format: aids in understanding of content, consistent throughout document, appropriate format chosen, reasonable margin and font sizes, reasonable font choice or legible handwriting
 - xi. [9 points] **Division C only:** A scientific writing style should be evident that includes adequate detail, succinct explanations, no unnecessary information, neutral and impersonal perspective, declarative and expository tone
- b. It is not necessary for teams to construct or test any physical prototypes. Research involving physical devices or video of physical devices will not be scored.

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- c. Participants may receive advice and feedback on their proposal, but all uncited words and images must be their own. Even though Division B is not scored on references, any unoriginal content must still be cited.

3. THE COMPETITION:

- a. Event Supervisors will review a team's proposal before that team's competition time. During the competition Event Supervisors will conduct a 5-minute Question & Answer session with the team about their proposal over video conferencing software.
- b. The Question & Answer session is a chance for Event Supervisors to get a deeper understanding of the team's proposal and design process, not to give feedback about the proposal. Questions may include but are not limited to:
 - i. If you were also to consider this factor in your analysis, how would that change your thinking?
 - ii. What were your goals in designing your vehicle?
 - iii. If the construction parameters were different in this way, how would that affect your design?
 - iv. How would you decide in what way to adjust your device for a particular target distance?
- c. The Question & Answer responses will be scored on the following areas, where each area is worth the specified number of points:
 - i. [5 points] Ability to offer clarification on the proposal
 - ii. [5 points] Justification of answers
 - iii. [5 points] Understanding of Mousetrap or Gravity Vehicle rules
 - iv. [5 points] Understanding of design principles
 - v. [5 points] **Division C only:** Good scientific communication
- d. Teams must participate in a Question & Answer session to receive a score for their proposal.

4. SCORING:

- a. The proposal score will be scaled to be worth 75% of the overall score, and the Q&A will be scaled to be worth the remaining 25%.
- b. There will be at least two Event Supervisors scoring the proposals and Question & Answer session to minimize the subjective nature of the event.
- c. Proposals submitted late and/or in an improper format will have their proposal score multiplied by 0.9.
- d. If the proposed device would incur a construction violation according to the Mousetrap or Gravity Vehicle rules, or the proposal excludes the information necessary to make that determination, the overall score will be multiplied by 0.7.
- e. Ties will be broken using the following criteria in this order:
 - i. highest proposal score
 - ii. predetermined scoring rubric sections.
- f. If Event Supervisors have strong cause to believe a team is in violation of rule 2.f., the team may be subject to disqualification for plagiarism.