# FERMI QUESTIONS

**See General Rules, Eye Protection & other Policies on www.soinc.org as they apply to every event.**

1. **DESCRIPTION:** Teams provide answers to a series of "Fermi Questions"; science related questions that seek fast, rough estimates of a quantity, which is either difficult or impossible to measure directly.

   **A TEAM OF UP TO:** 2 **APPROXIMATE TIME:** 50 minutes

2. **EVENT PARAMETERS:**
   a. The participants must bring writing utensils. No other materials or resources are allowed.
   b. The event supervisor will provide the questions, scrap paper, and answer sheets with identifying units.
3. **THE COMPETITION:**
   a. Each team will have the same amount of time to answer as many questions as possible.
   b. All teams competing in a given time block will be quizzed together and will be given no feedback during the contest.
   c. All answers are to be written to the correct power of ten (exponent) as follows:
      i. For a number in the form $Cx10^E$, the guide for rounding of the coefficient (C) is: if C is 5 or greater (to 9.99...), round C up to 10. For example, if the number is $5.001 \times 10^3$, the correct power of ten is 4. Responses recorded as $5.001 \times 10^3$ on the answer sheet will be marked as incorrect.
      ii. If C is below 5 (and greater than 1), round C down to 1. For example, if the number is $4.99 \times 10^6$, you record 6 as your answer.
      iii. All answers must be written to only the correct power of ten (exponent). The answer will include only the exponent and NOT the coefficient. For example, if the calculated value is $3.67 \times 10^7$, the correct answer would be 7.
      iv. **All answers must be written as an integer.**
   d. Positive exponents are the default. For negative exponents, the minus (-) sign must be included in the answer. If the number is $1.5x10^{-3}$, the correct power of ten is -3.
   e. Teams are allowed to finish before the allotted time: they should hand in their answer sheet, have the time recorded by the event supervisor, and exit the room quietly.
4. **SAMPLE QUESTION/TASK:**
   a. "How many drops of water are there in Lake Erie?" requires an estimate of the volume of a drop, the volume of Lake Erie from its approximate dimensions and conversion of units to yield an answer.
   b. "What is the mass of helium gas is required to fill the Goodyear Blimp?" requires an estimate of the volume of the Goodyear Blimp, the number of helium molecules, and the mass of those molecules to yield an answer.
   c. "How many birds are in the Amazon Rain Forest?" requires an estimate of the number of birds on the planet and the surface of the planet covered by the Amazon Rain Forest to yield an answer.
5. **SCORING:**
   a. High score wins.
   b. Ties are broken by counting the highest number of answers that receive five (5) points. If the number of 5-point answers is the same, the number of 3-point answers will be used. Time is used as the third tiebreaker, if needed.

| **If the response is:** | **It earns:** |
|---|---|
| Equal to the accepted value | 5 points |
| ±1 of the accepted value | 3 points |
| ±2 of the accepted value | 1 point |

**Scoring Example:** If the accepted value is seven and the response given is 7; then five (5) points are awarded. A response of 6 or 8 receives three (3) points and a response of 5 or 9 receives one (1) point.

**Recommended Resources:** The Science Olympiad Store (store.soinc.org) carries a variety of resources to purchase for this event; other resources are on the Event Pages at soinc.org

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