

## METRIC MASTERY

1. **DESCRIPTION:** Students will estimate and then measure identical objects in metric units. The properties to be measured may include mass, volume, density, area, force, distance, time, and temperature.
  
2. **EVENT PARAMETERS:** **A TEAM OF UP TO: 2** **APPROX.TIME: 50**  
**Minutes**
  - a. Event may take place **in one or two rooms with a minimum of 15 stations.**
  - b. Supervisors will furnish pencils and all measuring devices needed for the event.
  - c. Teams may not bring calculators, watches, writing implements, electronic devices or notes into the competition. For the **Measurement Part**, teams **may bring a hand-held non-programmable calculator.**
  - d. Measuring devices of any kind, including fingers, pieces of paper, pencils, clothing, etc., may not be used **in** the Estimation Part of the **event**.
  - e. Students will **rotate** through the stations to make their estimations and then, **using identical objects**, make their measurements. Measuring devices will be kept out of sight during the **Estimation Part** of the competition.
  - f. The **property** to be estimated/measured **and the units of the response** will be identified in the directions at each station.
  
3. **THE COMPETITION:**
  - a. **Estimation Part:**
    - i. Teams will be given a form on which they will record their estimations. This form must be turned in before beginning the Measurement Part of the event or the team will lose the score for this Part.
    - ii. **Students will rotate through the stations as directed by the supervisor. The recommended time at each estimation station is 30 seconds.**
    - iii. Students may **not** touch, feel, or “heft” any of the objects, unless the **station** directions specifically state the object may be moved or touched.
  - b. **Measurement Part:** (**Note:** Prior to the competition supervisors are to determine the acceptable measurement/correct value with the same equipment that is to be used in the event)
    - i. The teams will be given a second form on which they will record their measurements.
    - ii. The recommended time at each station for the measurement part is 60 seconds.
    - iii. Measurements will be made using the instruments supplied keeping in mind the instrument’s resolution (the smallest actual graduation or markings on the instrument plus one estimated digit). **An instrument’s resolution will refer to the smallest divisions (markings/graduations) on its scale.**
    - iv. To receive points, measurements must be expressed using the proper resolution and estimated digit appropriate for the instrument(s) provided (e.g., if an answer should be 9.0 cm and the answer given by the team is 9 cm, the answer will be marked wrong).
  
4. **SCORING:**
  - a. Scores for both parts of the event will be rated according to the accuracy of the estimates or measurements. **Rankings will be by highest combined score.**
  - b. For the Estimation Part, scores within **5%** of the correct value, as determined by the event supervisor, will be awarded 5 points, within **10%** will be awarded 3 points and within **20%** will be awarded 1 point.
  - c. In the Measurement Part, the correct measurements, **as determined by the event supervisor**, expressed to the instrument’s resolution including one estimated digit will receive 5 points. **Values will be considered correct at regional tournaments if the value is within (+/-) 3 of the estimated digit;**

**at state tournaments if the value is within (+/-) 2 of the estimated digit; and for the national tournament if the value is within (+/-) 1 of the estimated digit.** Example: If the national supervisor measures the width of a page as 209.1 mm using a ruler whose smallest divisions are 1 mm, then any value from 209.0-209.2 mm would be accepted as a correct answer. All others receive zero **points**.

- d. **Penalties:** A 10 point penalty will be given for each of the following team violations:
  - i. Does not return measuring devices to their original **location**.
  - ii. Does not clean up any spills.
  - iii. Alters the equipment (e.g., zeroing a balance or altering other equipment-may also result in DQ).
- e. Ties will be broken using pre-selected tiebreaker stations.