MISSION POSSIBLE DRAFT RULES 17

1. DESCRIPTION: Prior to the competition, competitors will design, build, test, and document a Rube Gildberg ® like device that complete a required task through an optional series of simple machines.
   A TEAM OF UP TO: 2 IMPOUND: State and National only EYE PROTECTION: C
   SET UP TIME: 30 Minutes for points MAX RUN TIME: 3 minutes
2. EVENT PARAMETERS:
   a. All participants must properly wear eye protection at all times. Participants without proper eye protection must be immediately informed and given a change to obtain eye protection if time allows. Participants without eye protection will not compete and be ranked in Tier 3
   b. Each device must pass a safety inspection before operation.
   c. Event supervisors will need meter sticks, stopwatches, and measuring tape.
   d. Uncontrolled flames, as well as hazardous liquids, gases and materials (e.g., rat traps, lead objects, combustible fuses) and unsafe handling of chemicals will not be permitted. No Flammable gasses allowed. Devices with potential hazards or safety concerns must not be permitted to run unless safety concerns are resolved to the satisfaction of the event supervisor; otherwise they must receive only participation points.
3. CONSTRUCTION PARAMETERS:
   a. During operation, devices dimensions can be no greater than 60.0cm (D) x 60.0cm (H).
   b. The device must begin with the Start Action and end with the Final Action as listed in Section 4a and 4c.
   c. The device must be designed and constructed to consecutively execute a sequence of actions from one action to another, including the mechanical timing.
   d. All actions used for scoring must be visible. The top and at least one vertical wall must be open or transparent for viewing all actions.
   e. Any task in the device not designed to contribute to the completion of the final task will not count for points. Parallel and/or dead end actions are not allowed.
   f. Each movable/adjustable physical object in the device must be utilized by one assigned action.
   g. Other non-scorable actions may be incorporated into the device but must contribute to the completion of the Final Action, receive no points and be listed on the Action Sequence List (ASL).
   h. Energy devices (i.e., springs/mousetraps) may be set prior to starting the device.
   i. No electrical timers are allowed. An electrical timer is defined as a scorable or non-scorable action that is powered by electricity that takes longer than 10 seconds.
   j. Only commercial batteries, not exceeding 14.4 volts as labeled, may be used to energize each of the Device's electrical circuits. Multiple batteries may be connected in series or parallel as long as the expected voltage output across any two points does not exceed 14.4 volts as calculated using their labeled voltage. Teams must be able to supply, or controller(s). Batteries will not be counted as a scorable chemical reaction. All use of batteries must comply with the Science Olympiad Battery Policy at www.soinc.org.
   k. Student must be able to answer questions regarding the design, construction, and operation of the device per the Building Policy found on www.soinc.org.
4. THE COMPEITION:
   a. Start Action (100 Points) – Participants must detach and remove a magnet from the device, this action of detaching the magnet must begin the chain of events due to the removal of the magnetic force.
   b. Scorable Actions – Participants may have up to 12 scorable unique actions to count for points.

i. A chemical reaction that inflates a balloon so that the balloon strikes an object that is at least 20 cm away from the balloon, so that the action of striking the object continues the sequence of events.
ii. An endothermic action that begins the next action as a result of reduction in temperature.
iii. An exothermic action that produces light to activate a photocell and begins the next action.
iv. Add water to a closed container so it completes an electric circuit and begins the next action.
v. Use an infrared beam where the transmitter and receiver are at least 20 cm apart to begin the next action.
vi. Use light to initiate a chemical reaction to begin the next action.
vii. A pulley system with an ideal mechanical advantage (IMA) of at least 7, that lifts an object that is at least 500g at least 10 vertical cm before the object initiates the next actions.
viii. Use the mechanical advantage of all 3 classes of levers in sequence to begin the next action.
ix. A pulley system that has an ideal mechanical advantage (IMA) of 0.50 that lifts an object that is at least 500g
x. Flip an unmodified US quarter airborne so that it goes from heads to tails up and begins the next action.
xi. A thermal action using the expansion of gas to activate the next action
xii. Activation of a student-made electromagnet that begins the next action.

c. Final Action: (250 Points) – The device must play a recording of the phrase "The End" to signal the end of the competition. This phrase must be clearly audible, and demonstrated for the judges prior to the run.
d. An Action Sequence List (ASL) must be submitted to the event supervisor at impound. ASL must be legible, neat, and an accurate documentation of each scorable and non-scorable action of the device's operation. Scorable and non- scorable actions must be numbered and documented in the ASL and correspondingly labeled in the device. Scoring will be based only on task listed in the ASL. See www.soinc.org for an example of the format required.
e. The Target Operation Time is 60 seconds at Regionals/ Invitational, 61 to 90 Seconds at State, and 91 to 120 seconds at Nationals. For State and National tournaments, time will be announced at setup.
f. Timing and scoring begins when a competitor pulls a magnet from the device. Timing stops when beginning of the word "END" is heard, or when 180.0 seconds elapse, whichever comes first.
g. Participants must designate an action taking over 30 seconds that doesn't use electricity or springs for power.
    i. A 1-point bonus will be awarded for every full second past 30 seconds.
    ii. If the task is chemical, the bonus will be 2 points per second over 30.
    iii. The timer must successfully start the next task for any bonus points to count.
    iv. For state/national tournaments, the team must demonstrate how this timer is adjusted to account for the increased length of time over 60 seconds, for the points to count.
h. If the device stops, jams, fails, the participants will be allowed to "adjust" it to continue I Operation. Obvious stalling will result in disqualification.
i. If a participant completes a scorable action, or makes an adjustment, that leads directly to the completion of the action, then that action will not count for points, even if it is part of the Final Task.

j. If an action start out of ASL, all actions skipped in the listed sequence, even if completed, earn 0 points.
k. The supervisor will review with teams the data and tier recorded on the score sheet

5. SCORING:
    a. High score wins.
    b. For each of the following, 25 points should be awarded (100 points maximum):
        i. The ASL is submitted on time at device impound.
        ii. The ASL uses the format specified on www.soinc.org.
        iii. The ASL is 100% accurate of intended scorable and non-scorable actions.
        iv. The scorable &non-scorable actions within the device are labeled as in the ASL.
    c. For each of the following, 50 points should be awarded:
        i. Participants use no more than 30 minutes to set up their device.
        ii. The first time each unique action successfully completed as described.
    d. Award 100 points for completing the Start Task and 250 points for completing the Final Task.
    e. Award 100 points if the device only uses one battery source.
    f. Award 2 points for each full second (rounded down) of operation up to the Target Time.
    g. Award 1 point per full second past 30 second for a non-electrical timer if all conditions are met. (2 points if chemical)
    h. Award 0.1 point for each 0.1 cm that the device dimensions are under 60.0 cm in axis. (e.g.; Device measures 40.0 cm x 38.9 cm x 52.4 cm; receives 20.0 + 21.1 +7.6 = 48.7 points)
    i. Teams receive only participation points for impounding a device but non-competing, unsafe devices; devices that are remotely timed/controlled, or devices that fail to operate autonomously after starting.
6. PENALTIES:
    a. Deduct 1 point for each full seconds (rounded down) that the device operates past the Target Time up to 180.0 seconds (whichever occurs first).
    b. Deduct 25 points for each dimension of the device that exceeds 60 cm.
    c. Deduct 50 points for the 1st solid, or liquid that leaves the measured dimensions of the device.
    d. Deduct 150 points for each electrical timing task in the device. An electrical timer is defined as a scorable or non-scorable action that is powered by electricity that takes longer than 10 seconds.
    e. Deduct 15 points for each time the device is touched or adjusted during the operation time.
7. TIERS:
    a. Tier 1: Devices without any violations;
    b. Tier 2: Devices with construction violations (excluding dimension violations) or competition violations;
    c. Tier 3: Devices impounded after the deadline or those that are not allowed to run due to safety violations.
8. TIEBREAKERS:
    a. Ties are broken as follows:
        i. Fewest penalty points;
        ii. Smallest overall dimension (L +D +H) of the device.