

- vi. **Push or pull an object with a mass  $\geq 500$  g at least 10 vertical cm up an inclined plane with an IMA  $\geq 2$  before the object initiates the next action.**
- vii. Use a pulley system with an ideal mechanical advantage (IMA) of at least 3 to lift an object with a mass  $\geq 500$  g at least 10 vertical cm before the object initiates the next action.
- viii. Use the mechanical advantage of all 3 classes of levers in sequence to initiate the next action.
- ix. **Use gravity to clearly rotate a screw at least two full rotations so that it operates as a screw converting rotational force into linear force and moves an object at least 2 cm before that object initiates the next action. The screw must be marked so its rotational movement is clearly visible.**
- x. Launch an unmodified US quarter out of the top boundary of the device, so that it falls back into the device and initiates the next action. When the device is in the ready to run position, the quarter must be heads up. After the quarter is launched out of the device, lands back in, **and initiates** the next action the quarter must be tails up.
- xi. **Use electricity to directly or indirectly break a string or fishing line so that the breaking of the line initiates the next action.**
- xii. **Remove a magnet from a surface so that a magnetic object falls due to the removal of the magnetic force. That object must initiate the next action.**
- c. **Final Action (250 points) – The device must raise a perfectly square platform that is between 5.0-10.0 cm on each side, a vertical distance of at least 20.0 cm before it becomes the highest point of the device. The platform must be a single surface that is hard, non-tacky, and smooth with no lip on any of its edges. On the platform must be a freestanding, upright standard 9V battery which is not attached to the platform or any other part of the device. The action is complete when the top surface of the platform and the battery are above the entire device and movement stops. Only the battery can be supported by the platform and this action may not count as the timer.**
- d. **Two Action Sequence Lists (ASLs) must be submitted to the Event Supervisor at impound. The ASLs must be legible, neat, and an accurate documentation of each intended scorable and non-scorable action of the device's operation. Scorable and non-scorable actions must be numbered and documented in the ASLs and correspondingly labeled in the device. Scoring will be based only on the Scorable Actions listed in the ASLs. Example ASLs may be found on the event page at [soinc.org](http://soinc.org).**
- e. The Target Operation Time is 60.0 seconds at Regionals/Invitationals, 61.0 to 90.0 seconds at State, and 91.0 to 120.0 seconds at Nationals. For State/Nationals the time will be announced at setup and will be the same for all teams.
- f. Timing and scoring begin when a participant **drops the Ping-Pong ball into the device**. Timing stops when **the platform stops moving** or when 180.0 seconds elapse, whichever comes first. **If the device stops after 3 touches or the platform never stops moving, the time will be scored as 180.0 seconds.**
- g. Participants must designate **a timer**, an action taking over 10.0 seconds that does not use electricity or springs for power, **to be eligible for bonus points**.
  - i. **A 1-point bonus will be awarded for every full second the timer operates before the Target Operation Time. The timer must run for at least 30 seconds to earn points. The timer may run past the Target Operation Time but will not receive points for the duration after the Target Operation Time.**
  - ii. The timer must successfully start the next Scorable Action for any bonus points to count.
  - iii. For State/National tournaments, the team must demonstrate how this timer is adjusted to account for the increased length of Target Operation Time for the bonus points to count.
- h. If the device stops, jams, or fails, the participants will be allowed to **“touch/adjust”** the device up to three times to continue operation. **A single “touch” may consist of multiple touches and ends once the device runs again on its own.** 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 Action.
- j. If an action starts out of ASL order, all actions skipped in the listed sequence, even if completed, earn zero pts.
- k. The supervisor will review with teams the data recorded on the scoresheet.
- 5. **SCORING:**
  - a. High score wins.