

MISSION POSSIBLE

Description:

Participants will design, build, and test a Rube Goldberg-like Device, which incorporates up to ten (10) unique Action Transfers, and uses up to five (5) Forms of Energy in accomplishing a given task in **45 seconds**. The task will be identical for each team. Devices will be constructed prior to the competition.

Number of Participants: 2-3 **Time:** Set Up 10 min, Competition 5 min

The Competition:

1. Teams will complete the following task with their device:
 - A. **Pop a balloon** at the end of **45 seconds**.
2. The device will be started by some action of the team such as switching a switch, pushing a button, dropping an object, etc. Once the device is started the team must step back and wait behind the line designated by the Supervisor.
3. The device must fit inside an imaginary box **60 cm long x 60 cm high x 60 cm wide**. The device may use ambient room light but must not depend on direct sunlight to operate. All other sources of energy and actions must take place and remain within the imaginary box before, during and after the device's operation.
4. The task must be accomplished as close to one minute as possible. The maximum time allowed is **2 minutes** after which time the judges will stop their timers and end the run. Only homemade timers can be used (no store bought clocks or timers).
5. Points will be awarded for each **UNIQUE ACTION TRANSFER**, which does the following:
 - A. Create a unique action.
 - B. Cause a subsequent action that contributes to the completion of the task.
6. Points will also be awarded for each of the following forms of energy used: electrical, mechanical, heat, chemical, or electromagnetic (light, infrared, radio, etc.). No electric device may have or use an electric potential difference of more than 9 volts.
7. Teams must fill out and email the attached Action Transfer List to the Event Supervisor – snyder1057@aol.com by 8:00 pm the evening **BEFORE** the competition. Teams must then bring their device and a copy of their Action Transfer List to the competition area during the time slot designated on the event schedule. Teams will check in at the beginning of this time slot and be directed where to place their device. Teams will be given the first **10 minutes** of the time slot to set up their device. The event supervisor may be asking competitors to clarify various components on their Action Transfer List during this set up time. Judges will also be measuring devices during this time.
8. Each device must pass a safety inspection **BEFORE** operation. Uncontrolled or hazardous non-shielded falling or launched objects, hazardous materials or spills, hazardous flammable substances, faulty wiring or any other potential hazard can lead to disqualification. A safety inspection will occur prior to operation of the device.

9. At the end of the **10** minute set up time all teams will be required to step away from their devices. The event supervisor will then have each team run their device so that it may be scored. Prior to starting the device, the event supervisor may ask **ONE** member of the team to explain the sequence of action transfers and forms of energy in their device. **ALL** team members should be prepared to provide this explanation as the Supervisor will designate who will explain the device.

Scoring:

The scoring is based on the number of Unique Action Transfers and Forms of Energy that are integral to task completion, are successfully accomplished by the device and are on the action transfer list. The term unique means that a particular Action Transfer can count only the first time that it is used. Identical Action Transfers of the same type are allowed but not scored. For example: a rolling ball that flips a switch is an Action Transfer. A series of ten cascading objects (dominoes) that causes the next action would represent **ONE** Action Transfer not ten action transfers. The rolling ball and the dominoes could be used again, but not scored. 300 points are possible. Points will be awarded as follows:

- 5 points awarded for every action transfer on the action transfer list that is an integral part of the task completion (these points awarded whether or not the action transfer is successful during the competition.)
- 10 points awarded for each successful unique action transfer (a successful action transfer is one that occurs without assistance from the participants)
- 20 points awarded for each form of energy successfully used (maximum of 5) (10 points if the form of energy was an integral part of the device but did not operate successfully during the competition)
- 50 points awarded for successful completion of the required task (these points will be awarded even if the device stops and must be restarted, as long as the final task (popping a balloon) is performed by the device itself and not by a participant action.

Penalties:

Subtract 1 point for each second over or under the 45 second time limit to accomplish the required task (up to 75 points).

Subtract 10 points for each **“TOUCH”** (time the device stops and must be restarted) (up to 100 points).

Subtract **5** point for each object **or liquid** that falls out of or off the imaginary box (up to a maximum of **50** points).

Subtract 50 points if the Action Transfer List is not submitted by email to the event supervisor by 8:00 pm the evening before the competition.

NOTE: The device may not be restarted without the event supervisor's permission. After the device has been started, any student contact with the device without the supervisor's permission may lead to disqualification. A student wishing to make contact with the device after the device has started will say **“TOUCH”** to the judge at which time the judge will allow the student to contact the device. Each **“TOUCH”** request by a participant will result in a 10 point penalty as noted above. Time will continue to run while students are working on the device. Time will be called at **2** minutes even if the final task has not yet been accomplished.

Sample Action Transfer List

(please note: each resulting action becomes the next action in the action transfer list)

Action	Resulting Action	Successful completion	Energy form used (highlight the first time each energy form is used)	Successfully used
Ball rolls down ramp	completes circuit		Mechanical	
Completed circuit	Heats wire		Electrical	
Heated wire	Breaks string		Heat	
Broken string	Releases lever		Mechanical	
Released lever	Completes circuit		Mechanical	
Completed circuit	Turns on light		Electrical	
Light on	Trips photoelectric switch		Electromagnetic	
Photoelectric switch	Sounds buzzer		Electrical	