

Mission Possible 2012

Division B

Maryland Science Olympiad
Coach's Clinic

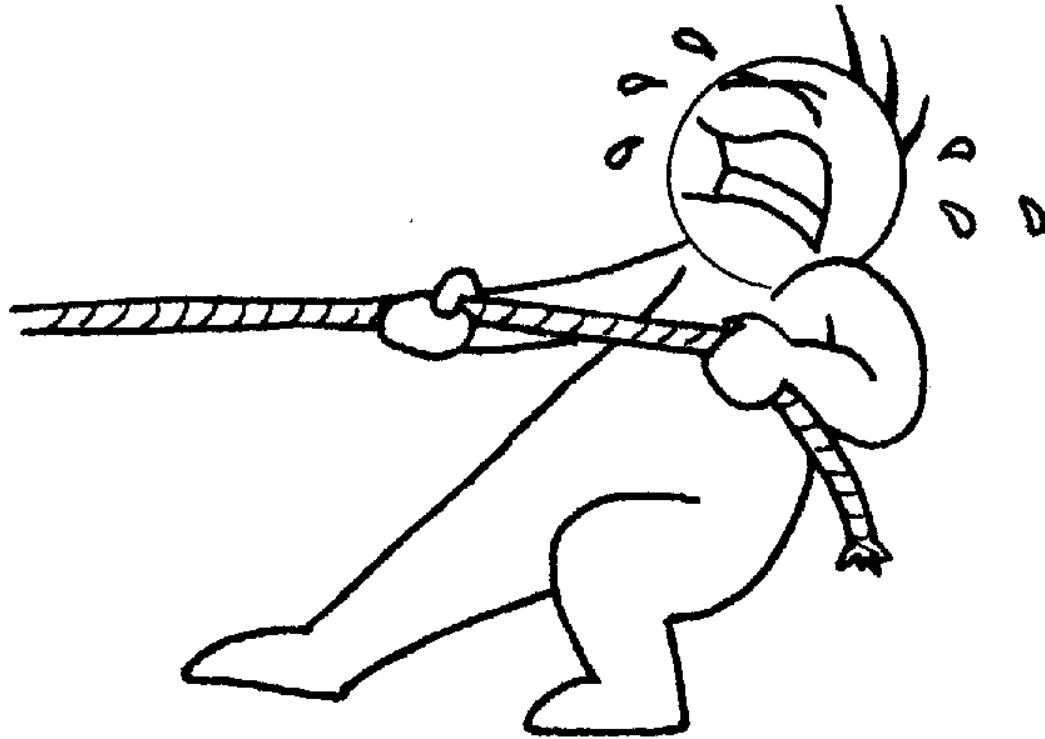
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Basic Event Parameters

- Entire device - 50.0cm x 50.0 cm x 80.0 cm, any orientation
- No fewer than 2 tasks in the machine
- No more than 10 tasks in the machine
- Starts by pulling a string
- Ends with raising a mass using a paddle wheel driven winch
- All other steps are OPTIONAL
- Mostly mechanical
- Limited electrical - Batteries, switches, and motors only
- 180 seconds max run time
- Optimal run time between 60 and 120 seconds

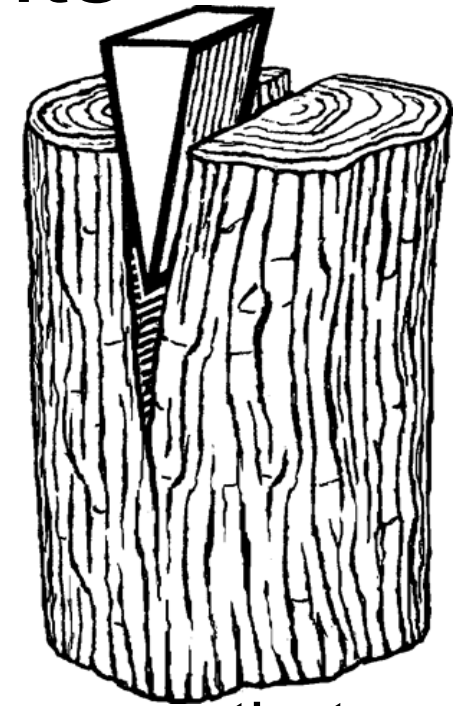
Required Starting Task - 100 Points

A) Initiate an action by pulling a string that extends out of the boundaries of the device.

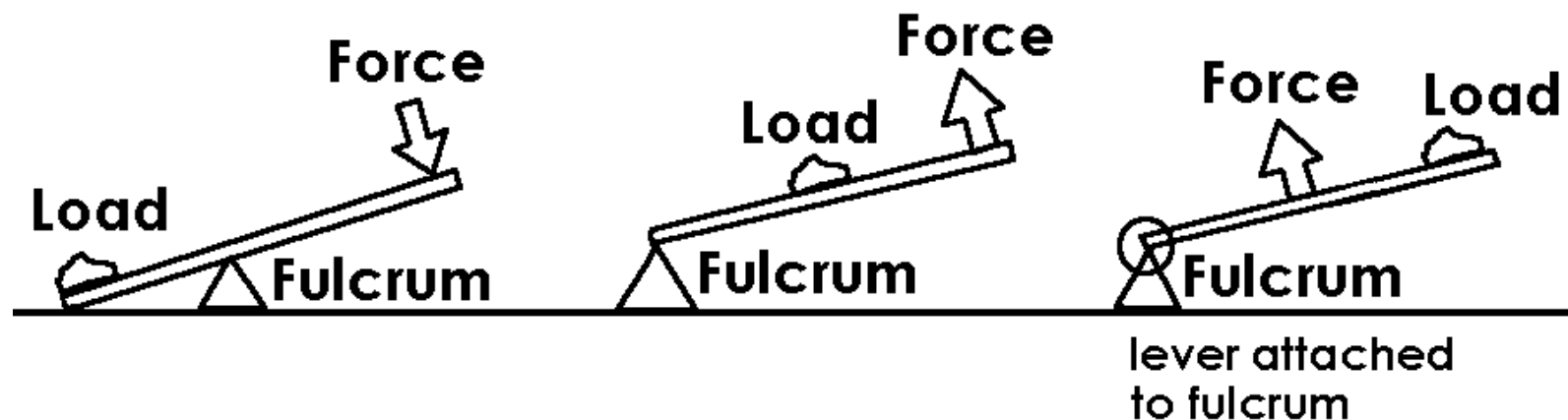


Optional Easy Tasks - 20 Points

B) Push a wedge between two objects so that they are separated to cause the next action.

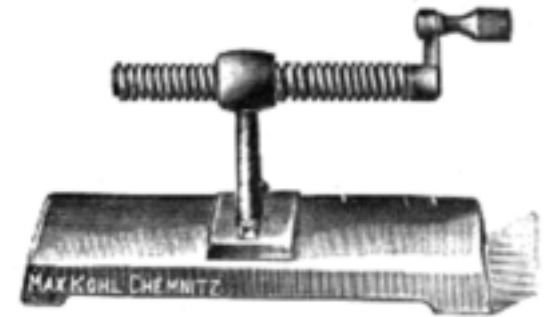


C) Use a lever with an IMA greater than 1 in a manner that requires an IMA greater than 1 to cause the next action (e.g., lift a heavier mass with a lighter mass).

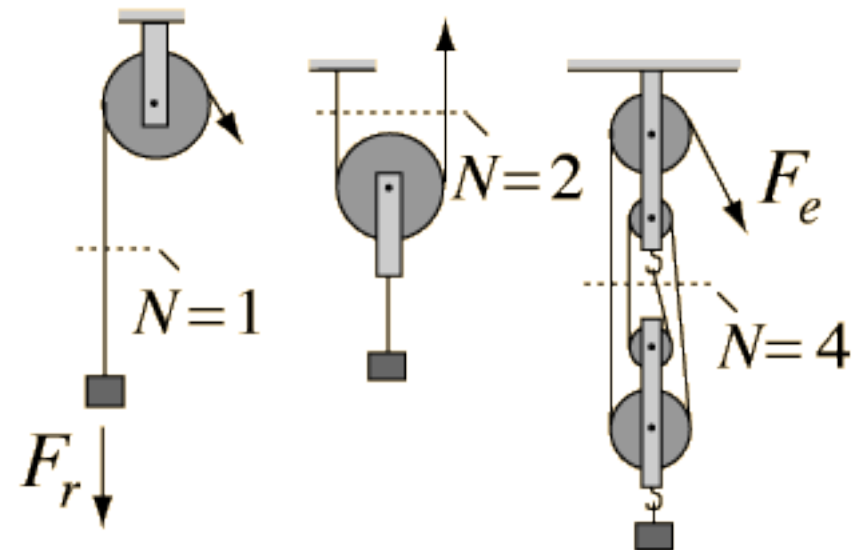


Optional Easy Tasks - 20 Points

D) Turn a screw such that it moves an object at least 2.0 cm in the direction parallel to the screw's axis of rotation before causing the next action.



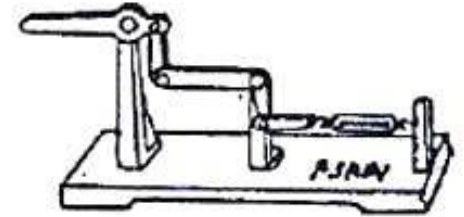
E) Use a pulley system with an IMA greater than 1 to lift an object at least 5.0 cm before causing the next action.



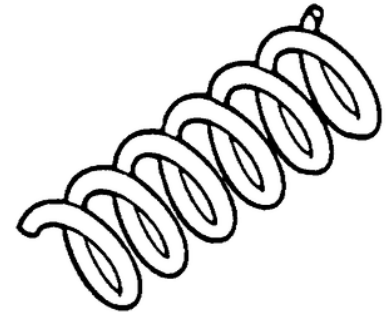
Pulley $IMA = N$

Optional Medium Tasks - 30 Points

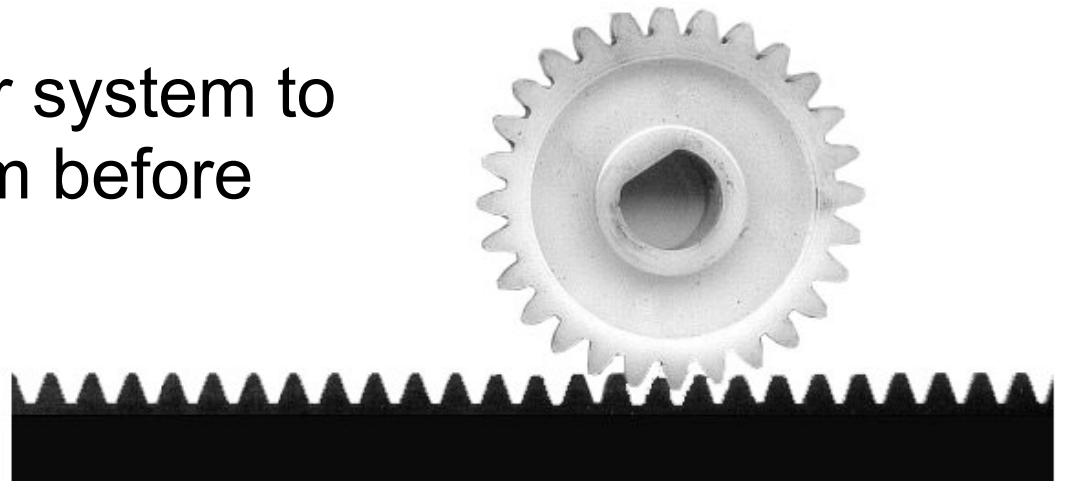
F) Combine two levers of different class into a system with an IMA greater than 5 and utilize the IMA greater than 5 to cause the next action.



G) Release the energy stored in a spring (not a mousetrap) such that it causes the next action.



H) Use a rack and pinion gear system to move an object at least 5.0 cm before causing the next action.



Optional Hard Tasks - 40/50 Points

I) Move an object with a third class lever at least 15.0 cm away from where it starts. The lever must not be in contact with the object at the beginning or end of this task. The final placement of the object must cause the next action.

J) Move and pour granular material from one container to another higher in the device. The presence of the granular material in the higher container must cause the next action.

K) Drop a bouncy ball such that at least the final 10 cm (measured vertically) of the downward motion is unguided and the upward bounce of at least 5 cm (vertical) causes the next action.

Opt. Special Task - 20 to 200 Points

L) Pull a mass up a ramp at least 10 cm (vertical), causing the next action. Bonus points will be awarded based on both the mass raised and the height travelled.

- 1 point for every 100 grams of mass lifted up the ramp in Special Task 1. Max 100 pts. (10 kg)
- 1 point for every whole vertical cm the mass is raised

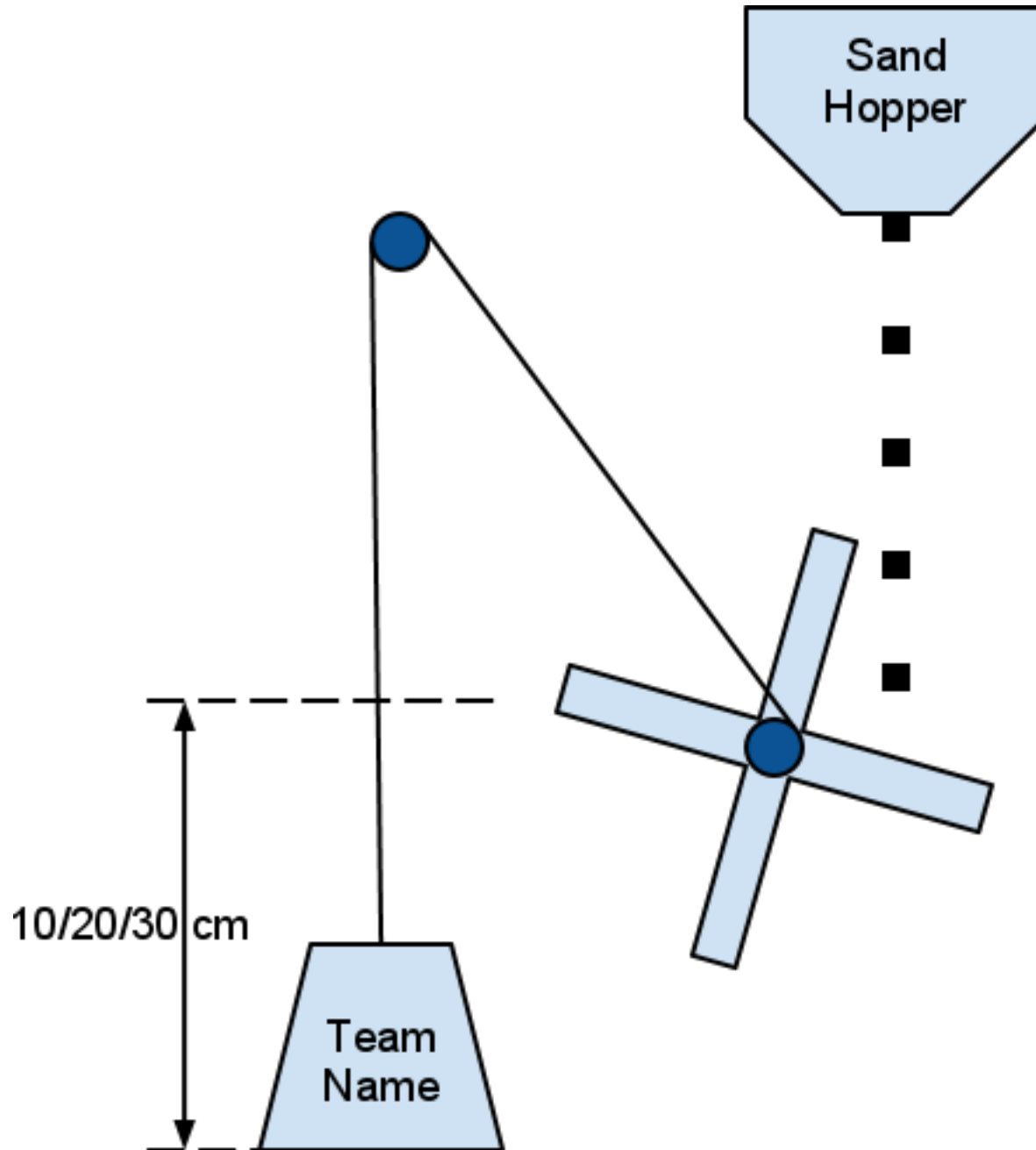


Required Final Task - 250 to 350 Points

M) Use a paddle wheel to lift a mass. All 5 conditions must be met.

1. Granular material must pour from a container onto a paddle style wheel. The weight of the granular material must be the only force turning the paddle wheel
2. The paddle wheel must be directly attached to an axle (i.e., no gearing, pulleys, counterweights, etc.)
3. The turning axle must wrap a string around itself lifting a mass displaying the team's name at least 10 cm at regional tournaments, 20 cm at State, 30 cm at Nationals
4. Teams must mark a line on the device, and timing must stop when the bottom of the mass passes the pre-marked the line on the device
5. The mass must be easily removed from the string wrapping around the axle.

Required Final Task - 250 to 350 Points



Task Sequence List

Documents all steps in your device

No.	Letter	Task	Points
1	A	String is pulled from outside box, flipping switch.	100
2	L	Switch turns on motor, pulling 400g mass up 27cm ramp.	51 (20+4+27)
		Mass triggers pendulum, swinging across device to hit trigger.	
3	G	Trigger releases spring.	30
		Spring pulls string.	
...		...and so on	
12	M	Paddle wheel lifts 25g mass above pre-marked line	255 (250+5)

See soinc.org website for template

How The Event Is Timed

- Starts when string is pulled
- Ends when final task completes or 180 seconds elapses
- Ideal run time for most time points
 - Regionals - 60 seconds
 - States - Between 60 and 90 seconds
 - Nationals - Between 90 and 120 seconds
- Time does not stop if device stops working



How The Event Is Scored

Time Points

- +2 pts/sec up to Ideal Time
- -1 pt/sec over Ideal Time

Additional Points

- +10 pts for each "self measured" movement
- +10 pts for each "self measured" IMA
- +100 pts if TSL is on time and accurate
- +50 pts if setup is complete in under 30 minutes
- Bonus points for Special Task L
- +1 pt/g lifted in the final task

Penalties

- -15 pts per "touch"
- -50 points (one time) for a boundary violation

Tiers and Ties

Tiers

1. Devices without any violations
2. Devices with construction violations or parallel or "dead end" paths
3. Devices impounded after the deadline

Tie Breakers

4. Fewest penalty points
5. Greatest mass of the weight lifted in the final task
6. Closest to Ideal Time