

# Trial/Pilot Event

Contact the organizers of your tournament to find out what trial/pilot events will be held.

## Break It On Down

What will happen? Your student(s) will be given a simple device such as a stapler. Their task is to make a list of all simple machines and energy transfers involved in the device accomplishing its purpose. The list of simple machines is actually a list of simple machine applications such as the top of the stapler acting like a Class 2 lever when it is pushed down to deliver the staple. The energy transfers are the same type as the Mission Possible device in the high school division. All students need to do is identify energy transfers in a manner such as electric to mechanical. Your students may bring the following information with them.

1. The **Five Basic Energy Forms** are electrical, mechanical, thermal, chemical, and electromagnetic spectrum (radio, infrared and visible light). Batteries, candles, rocket igniters, etc., may receive points determined by the resulting action. For example, if a candle melts wax restraining a string, it is thermal energy; if the candle trips a photo gate, it is electromagnetic spectrum; if the candle oxidizes the string, it is chemical energy. An **Energy Transfer** occurs when an action leads to the energy of the next action.

To help your students, they may actually bring this list with them.

- a) **Class 1 Lever** – the fulcrum is between the load and the effort.
- b) **Class 2 Lever** – the load is between the fulcrum and the effort.
- c) **Class 3 Lever** – the effort is between the fulcrum and the load.

Note - **Lever**: a rigid bar that pivots to exert a force. All levers must have an identifiable fulcrum, load, and effort. The load and the effort must be separate entities—they cannot be one and the same. In other words the effort cannot later become the load.

- d) **Inclined Plane** – a slope that reduces the effort required to move a load. To earn points the load must be moved at least 10 cm up a slope and the load must not descend back down the slope.
- e) **Wedge** – a wedge-shaped moving inclined plane that is driven under a load to lift it or into a load to split or separate it (direction of the output force must differ from the direction of the input force to score points).
- f) **Screw** – a rotating spiral-shaped inclined plane. To earn points the screw must rotate at least 360 degrees and the load must be moved at least 1 cm in a linear direction.
- g) **Wheel & Axle** – a rotating device that exerts a rotational force at its center (axle) when its outer part (wheel) is turned and vice versa. Therefore, if the input force is applied to the axle then the output force must come from the wheel or vice versa (must rotate at least 360 degrees to score points). A set of gears connected by teeth and a set of wheels connected by a continuous drive belt are each considered a valid Wheel & Axle, but a wheel used to simply reduce friction is not.
- h) **Pulley** – a wheel or set of wheels around which a single length (not a continuous loop) of rope or string passes to move a load. Ideally the direction of force would be changed by 180 degrees, but a change of as little as 90 degrees is enough to earn points.

### SCORING:

Engineers will prepare a rubric of the simple machine applications and energy transfers that will serve as the scoring standard for the event. Each correctly identified energy transfer or simple machine application is given a maximum of 5 points depending on how well identified the transfer or application is in the student explanation.