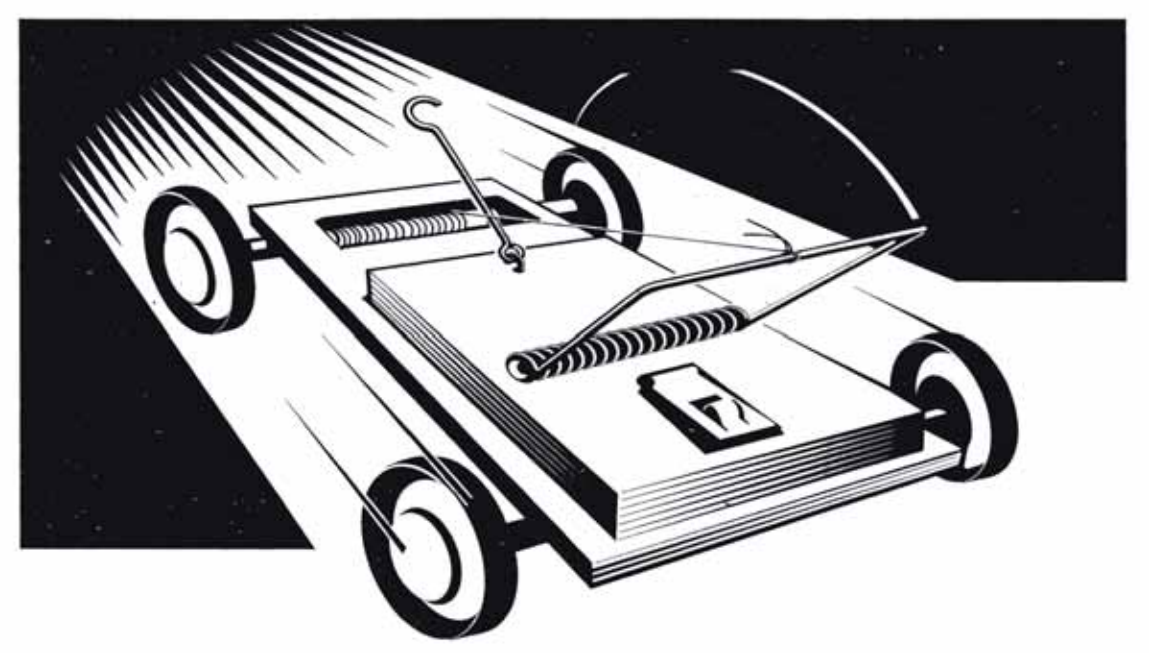
Mousetrap Powered Vehicle



Students will work in teams to design, construct and race a vehicle powered solely by a mousetrap.

Grade level

Middle school and up.

Materials (per team)

- Mouse trap
- Piece of plywood to serve as a chassis (can be any size but large enough to fit mousetrap on top)
- Two straws and two dowels to serve as the axles. (Make sure the dowels can fit inside the straws and can move freely.)
- Four plastic wheels (can be found in any hobby shop)
- Thread
- Glue

Discussion

Engineers use the laws of physics in the design and construction of many things you see every day. The physical concepts of force, inertia, friction, and mass are explored in this activity. A force is a push or a pull on an object. Inertia is the tendency of an object at rest to stay at rest or a moving object to keep moving. Friction is a force that resists movement between two surfaces. When designing a vehicle for speed and distance engineers look for ways to decrease friction; these ways include creating a smoother and more streamlined chassis and using lighter materials.

Activity

This activity can be done first as a demonstration by the engineer with the students grouped together in teams of three to four to construct the vehicle. Later it can be done as a team competition project using the following criteria: distance traveled, distance traveled with a payload and innovative design. The demonstration should take no more than a class period; a mousetrap vehicle competition can take one or several class periods, depending upon the learning objectives.

1. Arrange the students into teams of three or four.

2. Distribute the materials.

3. Glue the mousetrap onto the plywood chassis about three or four inches from one end. That end will be the rear of the vehicle.

4. Position the mousetrap so that the lever will pull to the rear.

5. Make a small opening in the rear of me vehicle just above where the axle will be placed.

6. Assemble the wheels and the axle by measuring a proper fit with the chassis (plywood) and cutting the dowels and straws.

7. Insert the dowel into the straw (spin to ensure that the wheels will turn easily), glue the wheels to the dowel and glue the axles to the front and rear of the chassis. Prior to attaching the rear axle, make sure you cut away the middle part of the straw. Next, tie the thread to the dowel and wrap the thread around the dowel. Leave one end free to tie to the mousetrap lever.

8. Once the vehicle is assembled, pull back the mousetrap lever, lock it into place, tie the loose end of the thread to it, and let it rip.

Additional Challenges

From this simple design, students can see how far the vehicle travels.

Using the physical forces, 'discus how the students can use different designs to propel the vehicle further. What will happen if you use larger wheels? Is there a way to decrease the friction in the axle?

What would happen if you increased the distance between the mousetrap and the rear axle?

In addition to setting up a competition among the students, you can have the students collect and analyze data such as calculating average acceleration, the coefficient of friction, the top velocity, graphing distance, velocity and acceleration versus time.

Notes

A simple design such as this should propel the vehicle about three to four feet. Better but more labor-intensive designs can propel the vehicle 1100 feet or more.

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