

## MOUSETRAP RACERS

Your task is to build a mousetrap powered car, built from wood, paper, plastic, metal, erector sets toys, Legos ©, or whatever other interesting material that you can think of. Each person will build his or her own racecar. Your car must be powered by one (*and only one*) mousetrap. A rat trap or trap for any other animal is not acceptable.

We will have races in class during the week of October 21. Cars should be ready by the 23<sup>rd</sup>. There will be a contest to win an award for:

- (A) Fastest car. Which car goes from the start line to the finish line in the shortest amount of time?
- (B) Furthest distance car. Which car goes the furthest?
- (C) Best decorated car, determined by a class vote. (*You cannot vote for your own car.*) If there is a tie then we will have run-off votes.

Much information on mousetrap racers is available online. However, you may not use a kit (from online or from a store) to build your racer.

<http://www.docfizzix.com/help.htm>

### **What is a mousetrap-powered car? how does it work?**

It is a vehicle powered by the energy of a mousetrap's spring. We tie one end of a string to the tip of a mousetrap's snapper arm and then the other end of the string has a loop that is designed to "catch" a hook that is glued to a drive axle. Once the loop is placed over the axle hook, the string is wound around the drive axle by turning the wheels in the opposite direction to the vehicle intended motion. As the string is wound around the axle, the lever arm is pulled closer to the drive axle causing the mousetrap's spring to "wind-up" and store energy. When the drive wheels are released, the string is pulled off the drive axle by the mousetrap, thus causing the wheels to rotate.

### **How do you build a mousetrap-powered racer?**

There is no one "right way" to build a mousetrap powered vehicle. The first step to making a good mousetrap powered car is simple, put something together and find out how it works. Once you have something working you can begin to isolate the variables that are affecting the performance and learn to adjust to improve your results. You build, you test and experiment, you change, and you do it all over again.

## **What is the difference between a FAST Racer and a LONG distance traveler?**

When you build a mousetrap car for distance, you want a small energy consumption per second or a small power usage. Smaller power outputs will produce less wasted energy and have greater efficiency. When you build a vehicle for speed, you want to use your energy quickly or at a high power output. You can change the power ratio of your vehicle by changing one or all of the following:

- where the string attaches to the mousetrap's lever arm
- the drive wheel diameter
- the drive axle diameter.

The amount of energy released by using a short lever arm or a long lever arm is the same, but the length of the lever arm will determine the rate at which the energy is released and this is called the power output. Long lever arms decrease the pulling force and power output but increase the pulling distance. Short lever arms increase the pulling force and the power output by decrease the pulling distance but increasing the speed.

If you are building a mousetrap car for speed, you will want to maximize the power output to a point just before the wheels begin to spinout on the floor. Maximum power output means more energy is being transferred into energy of motion in a shorter amount of time. Greater acceleration can be achieved by having a short length lever arm and/or by having a small axle to wheel ratio.

If you are building a distance vehicle, you want to minimize the power output or transfer stored energy into energy of motion at a slow rate. This usually means having a long lever arm and a large axle-to-wheel ratio. If you make the lever arm too long, you may not have enough torque through the entire pulling distance to keep the vehicle moving, in which case you will have to attach the string to a lower point or change the axle-to wheel ratio.

## **Supplies**

Standard hardware stores are good for getting glue, string, wood, objects that can be used as wheels, and the like. Other items can be scrounged from around the house insofar as possible.