

Grade 5
Mouse Trap Car
Contest

Student Manual

Grade 5 Mouse Trap Car Contest

Building a Better Mousetrap Car

You are challenged to create a "mousetrap car" that can be entered into a contest – boys and girls groups. The spring of a mousetrap can store a considerable amount of potential energy when it is pulled back and its tension is increased. When released, this energy can be transformed into the kinetic energy of movement, making the mousetrap the perfect "motor" for a homemade car. As the trap closes, the metal bar pulls a string that has been wound around the axle of the mousetrap car. This causes the axle and attached wheels to spin, propelling the car forward. While many aspects of the car's design can change, this will be the basic method of movement. Using your ingenuity, you will create a mousetrap car that will travel the farthest distance possible. On your mark, get set, build!

This activity will offer:

- A mousetrap car construction challenge.
- An arena for building and testing design ideas.
- An opportunity to critique the mousetrap car's performance, redesign it, and retest it.

Educator Note:

Use the suggested websites to obtain build tips and information on one or more designs. These designs should be used to discuss the general components and universal construction techniques needed to assemble a basic mousetrap car.

Contest Rules:

1. Design a vehicle powered by releasing a mousetrap spring.
2. The winning vehicle will be the one to cover the farthest distance possible.
3. No additional power source can be applied to the vehicle.
4. Teams of one or two students should work on each design. Teams of two may enter two different cars (one for each student).

Parent Involvement:

This is a friendly challenge whose main goal is for students to learn about science concepts like force, friction and aerodynamics in a fun and hands on way. Parents are encouraged to help students in the research, design and build process.

MATERIALS

1 Victor Mousetrap (about 2 inches by 4 inches) *Provided by the school.*

Approximate \$5.00 value of construction materials

Car Body - Wood, metal, a sturdy candy box or any other material for a car body on which the mousetrap is mounted.

String, glue, screws, etc.

Axels and wheels (can be from a toy or homemade) *I often get mine from dollar store cars*

Tools for constructing the car

Educator Warning:

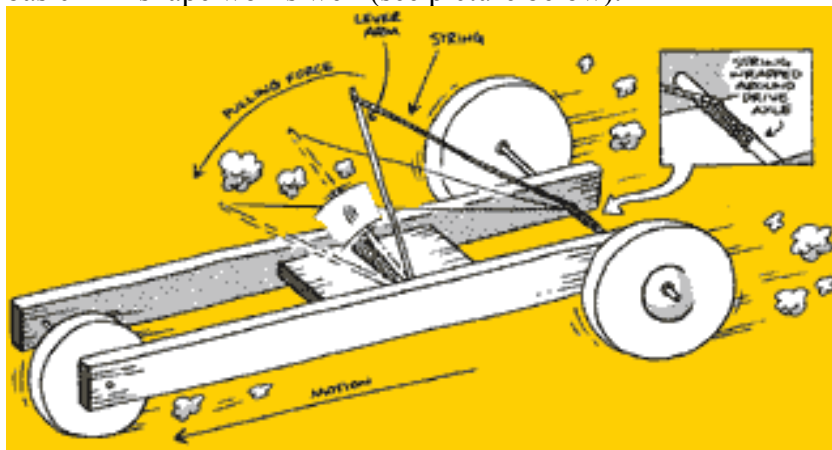
When launching the mousetrap cars, students should also be mindful of the "snap" of the mousetrap bar and use caution when opening, setting, and releasing the tension bar.

**** Never use rat traps. Rat traps can easily break a finger when snapped shut.**

PROCEDURE

Part 1- Car Design

1. Work alone or with a student partner/parent. Examine the images of mousetrap cars that have been provided in websites by your instructor.
2. Discuss the basic elements of designing a mousetrap car. Make a list. What design elements should be common to all cars? What is the sequence for assembly? Is there only one way to build a mousetrap car? Which parts of the design can be customized? Share your ideas.
3. Your first challenge is to build a non-powered vehicle. The car body can be made of many different materials and take many different shapes. All car bodies need to provide certain elements. They must offer a stable platform on which to attach the mousetrap and must provide access to the rear axle so the string can be attached. Students often find a basic "H" shape works well (see picture below).



From docfizzix.com

4. Discuss the placement and type of wheels that you will use. Will your car be supported by four wheels or will it have a tricycle design? Do large wheels work better than small ones? Does wheel width affect performance? Experiment to find out the answers to these questions.
5. Use what you've learned to create a blueprint for your competition mousetrap car. Don't be extravagant. Keep the design simple. Remember, this first test car is not yet powered.
6. Discuss your blueprints with your partner/parent. Assemble this non-powered vehicle and test it.
7. After testing your vehicle by pushing it along the ground, improve its performance. What changes can result in a more stable and longer traveling vehicle? How can those changes be implemented? (Hint: lighter cars with minimal surface friction tend to go farthest)

Part 2- The Power Plant

As you learned, the energy needed to propel the mousetrap car comes from the spring of the trap. When the spring is pulled back, it stores energy. With a controlled release of this tension, the energy can be transferred into the spin of the car's axle.

1. Review the design printouts so that you understand the nature and action of the mousetrap.
2. Compose a new blueprint that shows the placement of the mousetrap on your mousetrap car chassis. Include any design changes that are necessary to accommodate a pull string. Remember, one end of the pull string is tied to the spring bar of the trap. The free end is wrapped around the power axle. As the mousetrap spring shuts close, the movement of the controlled release is transferred to the spin of the axle.
3. Assemble this powered version of the mousetrap car. Make sure that you adhere to the construction techniques and design you identified in your blueprints.
4. Test the design. Does the car travel a far distance? How can it be made to go farther? Where is energy lost? How can the action of the mousetrap more efficiently be converted into movement of the car?
Think about these parameters. Redesign your car to test these factors and improve its performance.
5. Think about it. Can you gain an advantage with a longer "pull bar"? Will leverage increase the effectiveness of the mousetrap action? Design an experiment that would test if an extended bar would produce a more efficient car, then build and test your design.

Grade 5 Contest

Participate in a Grade 5 contest. See how far your car will go before stopping. Keep tweaking the design. Which team improves the most? Which team has the best design? What design elements are most critical to the design of a mousetrap car?

Suggested Websites:

http://www.docfizzix.com/how_work.htm

<http://www.pbs.org/saf/1208/teaching/teaching.htm>

<http://www.youtube.com/watch?v=OOobN0bUxqs>

<http://www.instructables.com/id/Mouse-Trap-car/>

<http://www.youtube.com/watch?v=XZ23q0QXPx0>

These are only a few of the many available websites. There are many other websites and You Tube videos that provide information and pictures.

Before you start to build, do your research. It is important to start from a good design and work to refine it rather than starting with a poor design and then trying to fix it. I have not found any one website that offers all the best information available – it is best to take the best suggestions from each site and use them on your car.

Note: One of these sites recommends using an elastic band instead of a string. This suggestion would add an additional power source and would not be allowed in this competition.

Some Pictures of Past Student Cars:

