



Curiosity Guide #301

Wheel and Axle

Accompanies Curious Crew, Season 3, Episode 1 (#301)

Mousetrap Car

Investigation #7

Description

Can you make a car out of a mousetrap? Yes, you can!

Materials per car

- Wooden mousetrap
- 4 eyehooks with at least a $\frac{1}{2}$ -inch opening
- 4 CDs
- Balloons or CD inserts
- 4 aluminum pop-can tabs or hot glue
- $\frac{1}{2}$ -inch wooden dowels or hollow plastic tubes, like from a pen body
- Drill
- 1/8-inch drill pilot
- Flat screwdriver
- Pliers
- Mason twine, 12 inches long
- Tape
- A stick to discharge the trap
- 80 grit sandpaper

Procedure 1: Making the car

- 1) Carefully drill 4 starter holes on each end of the mousetrap, about $\frac{1}{2}$ inch from each corner.

- 2) Make sure that the eyehooks slide easily over the dowel. If the eyehooks are too tight, pry them open a bit with a flat screwdriver.
- 3) Screw in the eyehooks so that they extend off the front and back of the mousetrap. Be sure the partial bent opening faces up.
- 4) Cut the wooden dowel so that the dowel is wider than the mousetrap by at least 2 inches.
- 5) Drill a small hole through the dowel or one side of the pen body.
- 6) If you are using a dowel, fish the twine through the hole and tie it off. If you are using a pen body or other similar plastic tube, fish the twine out an end, tie a large knot on the end, and pull the twine back in the pen body.
- 7) Slide the front dowel axles through an eyehook, then through 2 of the pap tabs, and then through the second hook. The front will be closest to the metal bar when the trap is not set.
- 8) Center the dowel. Slide the tabs against the eyehooks, then squeeze the tabs with pliers to ensure that they stay in place. If you prefer, secure the tabs to the eyehooks with hot glue.
- 9) Repeat with the second axle and back wheels. You can tell back from front because the back wheels will have balloon tread that you will apply in the next step.
- 10) Cut the ends off the balloons. Stretch the balloons around two of the CDs to provide a better grip against the floor. These will be the rear wheels. You could also scuff the wheel edge with sandpaper or cover them in tape to improve traction.
- 11) Make the ends of the dowels or plastic tubes wider and closer to the size of the CD opening holes by wrapping the ends with the balloons.
- 12) Carefully twist the wheels onto the ends of the axles. Be sure to keep the wheels straight.
- 13) Tie the loose end of the twine around the center of the bar on the mousetrap. Secure the twine with a small piece of tape.

Procedure 2: Testing the car

- 1) Carefully pull back the mousetrap spring, lock the spring in place, and attach the safety.
- 2) Wind the wheels backward.
- 3) Firmly hold the trap in the open position. Release the lock, place the car on the ground and let go! You can also use a stick to set off the trap and protect your fingers.

My Results

Explanation

The rubber-band-powered car is a good example of a wheel and axle that uses a speed multiplier. When a force is applied to an axle, the wheel itself travels more quickly because the wheel has so much more distance to cover in one rotation than the axle does. When the trap is set, the coil spring is under a lot of tension. The spring stores potential energy. When the trap is released, the bar swings back to close the trap. This quickly begins to spin the axle on the back wheels. The energy is changed into kinetic energy. The car begins to move, overcoming the friction between the balloon-covered CD wheels and the ground.

Investigate further:

Compare the mousetrap car to the rubber-band-powered car by having an indoor race.

Find photos of mousetrap cars on the internet. Look for different designs.

Experiment with design:

Mousetrap cars are a lot of fun to make, but it's a good idea to have an adult help so you don't hurt your fingers. Try making cars with different wheel sizes to see how that changes your results. Here are some other tips to think about:

- Lighter cars tend to go faster.
- Smooth axles improve performance.
- A longer string means more wheel rotations

What other mousetrap designs can you think of?

Think about:

It's amazing to think about how wheels and axles have changed our world. I think about that every time I push a full shopping cart at the grocery store, see a steering wheel on a sailing ship, go to an amusement park, play fooseball, or go rollerblading with my friends. We are surrounded by wheels and axles, so be sure to keep an eye out for them! How many different kinds can you find?

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