

## CHALLENGE 1

# RUBBER BAND CAR



## YOUR CHALLENGE

Build a car that goes really fast and really far (at least four feet, that is). Oh, by the way, your power source is a rubber band, and your car can only have two wheels. Start your engines!

## MATERIALS (PER CAR)\*

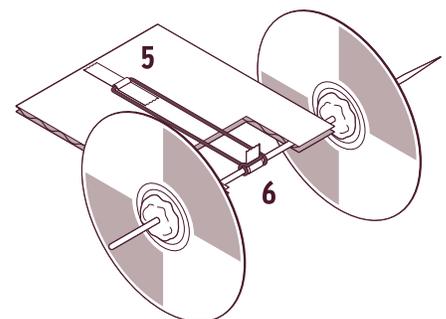
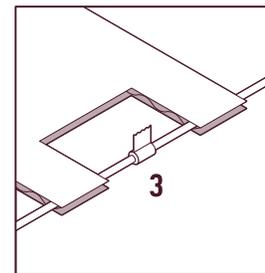
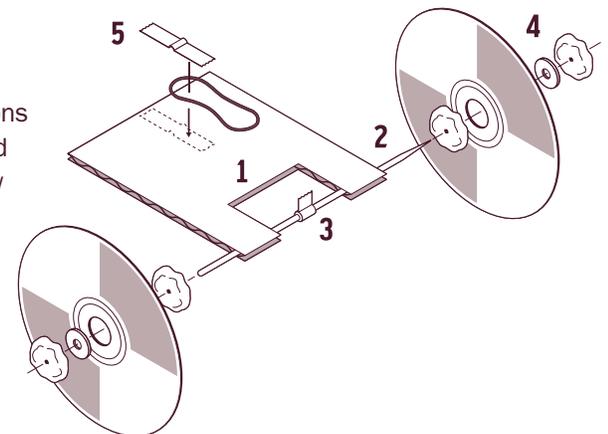
- 2 compact discs (CDs)
- Corrugated cardboard (one piece about 5 1/2 inches square)
- 2 faucet washers (Size: 1/4 inch Large)
- Poster putty (1/4 package—buy the tackiest available)
- Rubber bands of different lengths and widths
- Ruler
- Scissors
- Tape (masking or duct)
- 1 wooden skewer (buy the thinnest available)

\* For information on where to get these materials, see page 6 or visit [pbskidsgo.org/designsquad/engineers](http://pbskidsgo.org/designsquad/engineers).

## BUILD

- 1 Notch the body.** Turn the cardboard so that, as you hold it flat, the corrugations run right and left (i.e., not forward and back). Cut across the corrugations and make a 2-inch-wide and 1 1/2-inch-deep notch in the center of the side. Throw away the piece you've cut out.
- 2 Make the axle.** Slide the skewer through the cardboard, close to the outer edge. Make sure the axle sticks out the same amount from each side of the body.
- 3 Modify the axle.** Find where the skewer goes across the notch. In the middle of this section, wrap a small piece of tape to make a “catch” for the rubber band.
- 4 Assemble the wheels.** Slip a washer into the center hole of a CD. Slide the washer and CD onto the axle, leaving lots of room between the wheel and cardboard. Put poster putty on each side of the washer to join the CD, washer, and axle REALLY TIGHTLY TOGETHER. The wheel and axle should now rotate together. Make the second wheel the same way.
- 5 Attach a rubber band.** Choose one of the rubber bands. Tape one end to the cardboard at the end opposite the axle.
- 6 Power your car.** Wrap the unattached end of the rubber band over the catch. Turn the axle several times. You've given the rubber band **potential energy** (stored) **energy**. When it unwinds, the axle spins and this potential energy is transformed into **kinetic** (motion) **energy**. The more you wind the rubber band, the more energy can go to your car's wheels—and the farther and faster your car goes.

You've just built a **prototype**, which is an early version of a product. Prototypes help engineers understand a product's strengths and weaknesses and how it might be improved.



# RUBBER BAND CAR

## TEST AND REDESIGN

Wind up your car and set it on the floor. What happens when you let it go? When we made ours, we had to debug some things. For example, our axle didn't spin easily, the wheels wobbled, the poster putty stuck to the cardboard, and the rubber band jammed itself against the cardboard. If any of these things happen to you, figure out a way to fix the problem.

## TAKE IT TO THE NEXT LEVEL

- Modify the car so it can work on sand or thick carpet.
- Change your car so it can carry a tennis ball.

### INSIDE THE ENGINEERING

#### GLORIOUS GREASE

Greasy fast food may be bad for you, but it can be good for the environment. Take cooking oil. A group of kids converted an old school bus to use waste cooking oil as fuel. They drove it across the country, stopping to fuel up at fast food restaurants. They'd pull up to a restaurant, uncoil a hose, and pump the used grease into the fuel tank. After filtering out the bits of meat, onion ring, or doughnut, they'd drive away—fueled for free. Added bonus: the exhaust smelled like Chinese food, fried chicken, or whatever else got fried in the oil. And Mother Nature was happy—no harmful soot or sulfur dioxide like with regular diesel fuel, and less used cooking oil to clog landfills or pollute waterways. Grease-powered buses motoring around at 60 miles per hour—no wonder they call it *fast food*.

## TAKE IT ONLINE

Want some zip? Make a self-propelled toy that speeds across the floor! Download *Design, Build, Make It Go!* from Intel's *Design and Discovery* hands-on engineering program.

➤ [intel.com/education/designanddiscovery](http://intel.com/education/designanddiscovery)



Photo: Mika Tomczak

A professional racecar builder challenged the *Design Squad* teams to convert a red wagon and a tricycle into motorized dragsters. The teams raced their creations on a real 1/8-mile drag-race racetrack.



Watch *Design Squad* on PBS (check local listings). Download more challenges at [pbskidsgo.org/designsquad](http://pbskidsgo.org/designsquad).



Major funding for *Design Squad* is provided by the National Science Foundation and the Intel Foundation. Additional funding is provided by Tyco Electronics, National Council of Examiners for Engineering and Surveying, The Harold and Esther Edgerton Family Foundation, Noyce Foundation, Intel Corporation, American Society of Civil Engineers, and the IEEE.

This *Design Squad* material is based upon work supported by the National Science Foundation under Grant No. ESI-0515526. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

© 2007 WGBH Educational Foundation. *Design Squad* and logo are trademarks of WGBH Educational Foundation. All rights reserved. All third party trademarks are the property of their respective owners. Used with permission.

*Design Squad* is produced by WGBH Boston. Design and engineering consulting services provided by Continuum.

