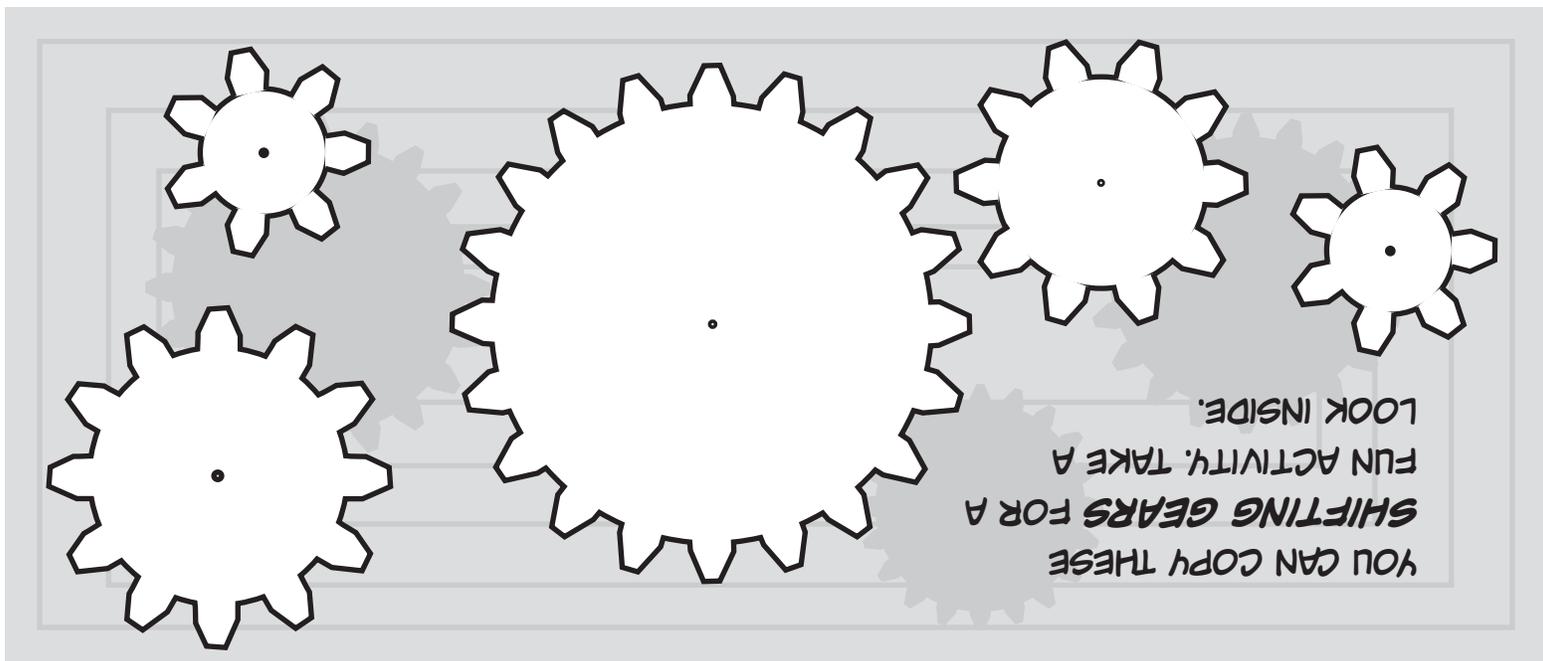
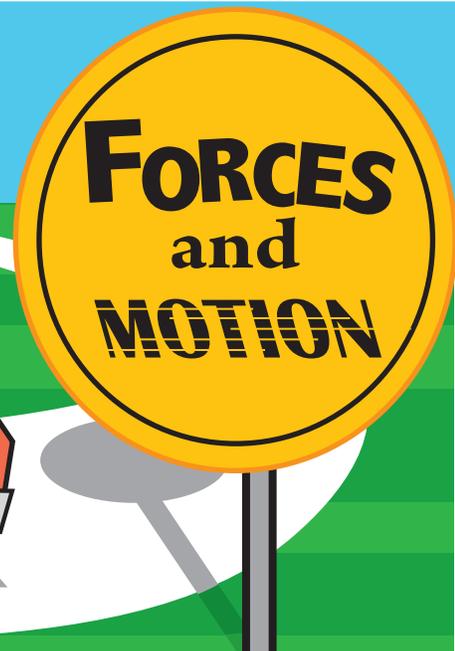
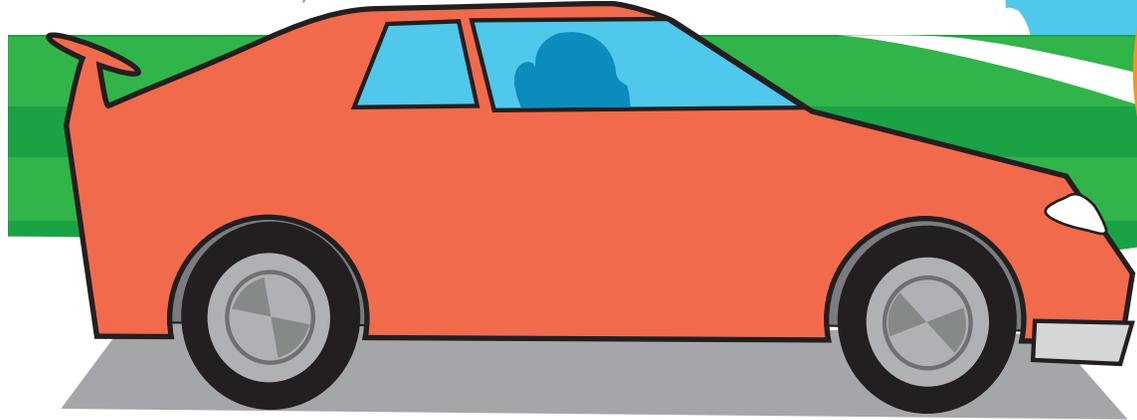


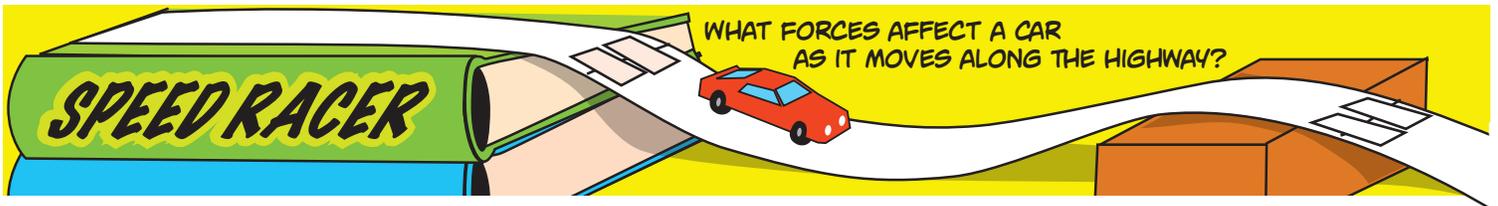
The goal of the *Progressive Insurance Automotive X PRIZE* is to inspire a new generation of viable, safe, affordable and super fuel efficient vehicles that people want to buy. \$10 million in prizes will be awarded in September 2010 to the teams that win a rigorous stage competition for clean, production-capable vehicles that exceed 100 MPG energy equivalent (MPGe). Visit progressiveautoxprize.org for more information. The Saint Louis Science Center, education partner to the X PRIZE, developed these activities to share with science center visitors around the country. For more information, email jboxer@slsc.org.

Written by Jennifer Boxer
Illustrated by Dennis Smith



PROGRESSIVE
AUTOMOTIVE **X PRIZE**





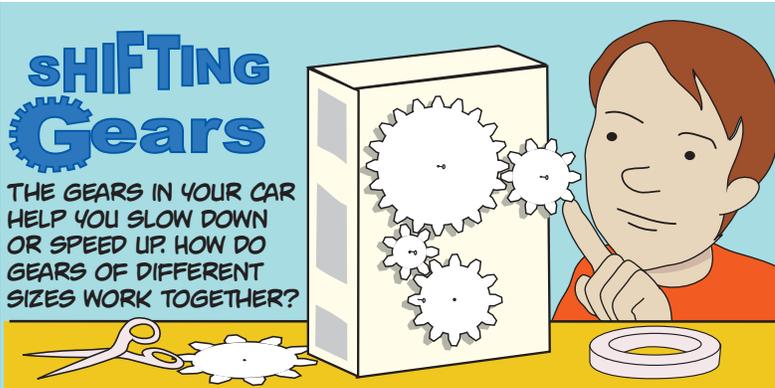
You will need:

miniature racecars, strips of poster board about an inch wider than your cars, tape

- The strips of poster board are your road. Experiment with different designs until you find the one you like best. Feel free to use furniture, books, etc. to shape your road.
- Tape the strips together to make longer roadways. How can you include a bump somewhere in your design?

- Send your cars along the way and watch them closely. Where do they speed up, slow down or stop? How does the steepness of the track affect their speed?
- What do you need to do to make sure a car stays on the track after the bump? How does gravity affect the cars on your track?
- Scientists know that when an object is moving in one direction, it tends to keep going that way. When does this happen with your cars?

You've been experimenting with forces of motion. Gravity keeps pulling your car toward the Earth. The steeper the hill, the faster the car goes. When it goes over a bump and into the air, gravity pulls it down, but momentum, another force, keeps it traveling forward. A moving car eventually slows down and stops because of the friction of its wheels against the track and of the car body against the air.



SHIFTING Gears

THE GEARS IN YOUR CAR HELP YOU SLOW DOWN OR SPEED UP. HOW DO GEARS OF DIFFERENT SIZES WORK TOGETHER?

You will need:

styrofoam or cardboard, scissors, gear patterns included with this activity, paper, pencil, straight pins, empty cereal boxes, masking tape

- Trace the gear patterns onto the styrofoam. You can also make other sizes that aren't shown. Be careful that the teeth of all the gears are the same size and distance apart.
- Stick a straight pin in the center of each gear. Turn the gear a few times to make sure it goes around smoothly.
- Stick the pins into the empty cereal boxes, arranging the gears so that their teeth interlock. If you move one gear the others should move. You can tape several cereal boxes together so that you can use more gears.
- Experiment with turning one gear to make the other gears move. What does the size of a gear have to do with the way it turns? When one gear turns one way, which way does the next one turn?
- Rearrange the gears and continue to experiment. If a small gear is connected to a larger one, does it turn more often or less often?

When you connect a larger gear to a smaller one, the smaller gear turns faster, giving you more speed. The second gear is smaller than the first gear on your car or bike. That's why when you shift from first to second you can go faster. If you need power to go up a hill, you shift back down to the lower (larger) gear. If two gears are the same size, they turn at the same speed. Gears that are next to each other turn in opposite directions.

Reinvent the Wheel (and Axle)

YOU CAN FIND A WHEEL AND AXLE ON ANY CAR. IT'S JUST A CYLINDER ATTACHED TO A LARGER WHEEL. CAN A WHEEL AND AXLE HELP YOU DESIGN A CAR THAT CAN CARRY WEIGHT?



You will need:

a flat piece of styrofoam or cardboard, scissors, 4 straight pins, pencil, something round to trace, pennies

- Trace your round object onto the styrofoam four times, to make wheels.
- Draw the shape you would like for the body of your car. Cut out the wheels and car body.
- Stick one pin through the center of each wheel.
- Attach the wheels to the sides of the car body, making sure they can turn freely.
- Design experiments with your car. How can you make it speed up? What makes it slow down?
- Can you design a system for the car to be propelled forward without you pushing it? Hint: One way to do this is with a balloon and a straw.
- What happens if you make the wheels smaller or bigger or if you put extra weight, like the pennies, on the car?

When the wheels on a car turn, they reduce friction between the load (the car body) and the ground so that it can move along much more easily. The axle in your model car is the straight pin; the wheel rotates around the axle. Larger wheels require more energy to get moving, but they are better at reducing friction than smaller wheels so, once they are moving, your car should go faster.