ENERGY AND NASCAR

LESSON PLAN 2: KINETIC ENERGY

ENERGY IN MOTION

TIME REQUIRED: 1 hour

MATERIALS: String, heavy and light objects (such as a pencil and a pack of index cards), paper cup, masking tape, ruler, textbooks, cardboard, toy car or completed car from the **Three Ds of Speed**

ACTIVITY SHEETS: Kinetic Energy Activity Sheet

THINK

Central question:
What is kinetic energy?

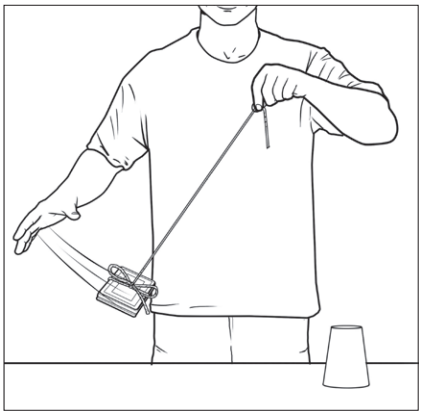
Have students consider what happens to potential energy when it's released from its stored state. Explain that energy can't be created or destroyed, but it does change from one form to another. Potential energy is often converted into another type of energy called kinetic energy. Kinetic energy is the energy of motion. Kinetic energy can also transform back into potential energy. For example, you'd use kinetic energy to lift a ball to the top of a ramp. That energy would be stored in the ball as potential energy.

MOVE

Central question:
What factors affect kinetic energy?

1. Explain that there are two factors that affect how much kinetic energy a moving object will have: mass and speed. Have students complete this demonstration to learn how mass influences an object's kinetic energy.

2. Select a light object (such as a pencil) and a heavy object (such as a pack of index cards). Tie a string around each object, leaving a three-foot-long piece attached. Have a student volunteer hold the light object in his or her right hand three feet above the ground. He or she should hold the other end of the string in his or her left hand so it is stretched horizontally. Have another student place a paper cup on the floor just under the first student's left hand, and mark the spot on the floor with a piece of masking tape. Tell the first student to let go of the object so it swings and collides with the paper cup (this may take a few tries to hit the cup). Have your other volunteer measure the distance the paper cup



moved after the swinging object struck it.

3. Repeat the process with the heavier object. Students will observe that the heavier object made more of an impact than the lighter one, moving the cup farther away. This is because the heavier object had a greater kinetic energy.

BUILD

Central question:
How can potential energy become kinetic energy?

1. Reveal that racecars don't just go forward and side to side as they pass each other on the race track, they also go up! NASCAR race tracks aren't completely flat. On turns, the tracks are actually tilted. The highest race track banking is tilted a steep 33 degrees at the Talladega Super Speedway.

2. Race track bankings help drivers maintain grip as they whip around corners. The steeper bankings also create more potential energy in the racecars because the cars are raised higher in the air. When drivers come off a banking and onto the flat portion of the track, they have more speed as the potential energy transforms into kinetic energy.

3. Explain that NASCAR engineers consider the height of a race track's banking when considering how cars will perform. Remind students that three factors affect how much gravitational potential energy the racecar has at the top of a race track's banking: the height of the banking, the car's mass, and the force of gravity. Given the fact that mass impacts kinetic energy, all racecars must weigh 3,300 pounds (without a driver). Having identical masses makes sure the cars are competitively equal. NASCAR enforces these rules by inspecting each car before and after each race. (If you have not explored aerodynamics with your class, refer to the **Three Ds of Speed** unit to learn how NASCAR drivers and engineers use science to create more speed on the track.)

4. Tell students they will team up to test how potential energy turns into kinetic energy. Hand out the *Kinetic Energy Activity Sheet* and the experiment materials. After groups have completed the experiment, have them present their results and discuss as a class.

TEAM UP

Central question:
How does kinetic energy influence NASCAR engineers' choices?

Explain that NASCAR engineers spend a lot of time thinking about kinetic energy for both racecar performance and safety. Divide students into teams, and tell them to put on their make-believe "engineer caps." They'll need to imagine all the parts of a NASCAR race from start to finish—that includes designing cars and tracks, installing safety protections for drivers and fans, understanding how vehicles will perform while racing and when making pit stops, and even things that could possibly go wrong during a competition. Have students create a list of the roles kinetic energy plays in each stage of racing.