ENERGY AND NASCAR

LESSON PLAN 3: FRICTION AND ENERGY

A DYNAMIC DUO

TIME REQUIRED: 1 hour

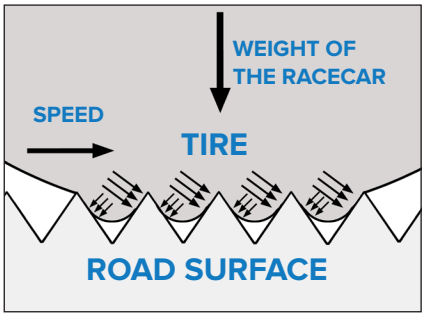
MATERIALS: Cardboard, toy car or completed car from the **Three Ds of Speed**, tape measure or rulers, tape, books, various surfaces (such as tinfoil, fine sandpaper, rough sandpaper, waxed paper, carpet)

ACTIVITY SHEET: Friction and Energy Activity Sheet

THINK

Central question:
How are kinetic energy and friction related?

1. Ask students to define friction—the resistance that one surface experiences when moving over another. For example, as a spinning tire rolls over a racetrack, the tire's surface catches against the road, creating friction that improves traction and helps racecars gain speed and increase grip. Grip, which is another word for friction, helps racecars stay on the track, even when navigating turns at high speeds.



2. At NASCAR, car tires, the racecar's aerodynamics, and the surface of the roads are all fine-tuned to make sure the racecars make solid contact with the ground. NASCAR tires are smoother than the tires on everyday vehicles. This allows more surface area on the tire to be in contact with the track. This smooth surface area provides greater grip at higher speeds, keeping racecars safe on the track. In addition, NASCAR tracks are made of specific surfaces, such as asphalt or concrete, which help tire friction and performance. Rougher surfaces increase friction, while smoother surfaces allow objects to slide more easily over them.
3. While friction can increase safety in racecars, it can cause problems, too. Due to a racecar's high speed, there is a lot of friction where the tires rub against the road. The friction takes some of the racecar's kinetic energy and converts it into heat energy. As a result, the racecar's tires become very hot and can eventually fall apart. This is why racecar teams change tires multiple times during a race.

MOVE

Central question:
What type of energy is created by friction?

1. Demonstrate how friction is heat energy by having students rub their hands together. Point out that the more vigorously they rub them, the warmer their hands will become. Any two surfaces that rub together will create heat.
2. Point out that friction depends on a force pushing two surfaces together. For example, when you rub your hands together, the more force you apply, the more friction and heat you will create. If there is no force, there is no contact; therefore, there is no friction.

BUILD

Central question:
What types of surfaces create the most friction?

1. Distribute the *Friction and Energy Activity Sheet* and tell students that they will build a high-friction racetrack to demonstrate the effects of friction on a rolling car. Point out that any contact between atoms or molecules that are moving against each other will create friction. Rough surfaces have more matter exposed than smooth surfaces—more nooks and crannies—and this can create more available spots for possible friction.
2. After the discussion, have students create a cause-and-effect chart that analyzes the impact of friction on their experiment and explain the effects of friction on kinetic energy.

TEAM UP

Central question:
How can we diminish friction?

Explain that racecar engineers study friction to improve the speed of racecars. They work to diminish friction so the cars can move quickly, but they don't want to get rid of friction altogether, because friction allows the cars to slow down and stop. Divide students into problem-solving teams and give them the task of brainstorming ways to remove friction from their daily lives. Their lists should include sources of friction around them and an explanation of how removing that friction would make their lives better. If they need idea prompts, share this list of everyday items that experience friction: car tires, skateboard wheels, train tracks, revolving doors, zippers. Have groups present their recommendations to the class.

AFTER THE UNIT: Once you have finished all three lessons, have students complete the post-assessment and compare their responses to the pre-assessment.

POST-ASSESSMENT ANSWER KEY:
1. B; **2.** D; **3.** D; **4.** B; **5.** B; **6.** C; **7.** A; **8.** A; **9.** B; **10.** D