

# GET A GRIP

## **BENCHMARKS and TASKS**

**SC.C.2.2.3** The student knows that the more massive an object is, the less effect a given force has.

**SC.C.2.2.4** The student knows that the motion of an object is determined by the overall effect of all of the forces acting on the object.

- The student identifies force as any push or pull (e.g., gravity, electricity, and magnetism) that causes objects to change their state of motion. The greater the force is, the greater the change in motion.
- The student demonstrates how inertia (an object's tendency to resist a change in motion), gravity, friction, and mass affect motion.

## **KEY QUESTION**

How does friction affect the amount of force needed to move an object?

## **BACKGROUND INFORMATION**

**Friction** is a **force** that can start things moving, slow things down, and even stop things altogether. The friction between a moving object and the surface it's moving on causes the object to slow down. All surfaces contain imperfections like bumps and craters. When two surfaces are rubbed against each other, the roughness of one surface catches on the roughness of the other surface, resulting in friction. The two things that affect the amount of friction are roughness of the surface and mass of the object.

A force is a push or a pull on an object. The international unit of force is the newton, named after the English scientist Sir Isaac Newton.

## **MATERIALS**

### **Class**

hand lotion

### **Per group of 3**

1 heavy, used book

1 length of string

1 spring scale

2 pencils

### **Per student**

hand lens

*Get a Grip* activity sheet

## **TEACHING TIP**

1. If students have not had experiences with spring scales, allow an exploration period prior to the lesson.
2. Make sure students understand how to read the spring scales in newtons, units of force.

## **ENGAGE**

1. Tell students to put their hands together and rub briskly for 10 seconds. Ask: *What do you feel?*
2. Pour or squeeze a little hand lotion into the palms of students' hands and again have them rub their hands together briskly.
3. Ask: *Why was it easier for you to rub your hands together the second time?* (smoother surface)  
*Why was there less heat?* (less friction)

## **EXPLORE**

1. Divide the class into groups of three and distribute the materials.
2. Have each group select three surfaces (e.g., desktop, cement, carpet) and list the surfaces in the spaces provided on the activity sheet.
3. Ask them to run their hands over the surface, observe the surface with a hand lens, and then describe each surface in Part 1 of the activity sheet.
4. Have students predict which surface will produce the most friction and which surface will produce the least friction when something moves across it by numbering the surfaces in Part 2 on the activity sheet.
5. Open a heavy book to the middle and tie a length of string around the binding.
6. Attach the spring scale to the string.
7. Have one group member place the book on the first surface and move the book across it by pulling on the spring scale, keeping the spring scale parallel to the surface.
8. Another group member should determine the amount of force being exerted by reading the spring scale.
9. Each student should record the measure of force in newtons on Part 3 of the activity sheet.
10. Repeat the steps with the other two surfaces.
11. Have students take turns pulling, measuring, and recording.

## **EXPLAIN**

*What information did you use to make your predictions? Were your predictions accurate?*

*Which surface produced the most friction?*

*Which surface produced the least friction?*

*How can friction be reduced?*

*How can friction be increased?*

*Work is accomplished when an object moves as a result of force acting upon it. Was any work done? (Work was done because the book moved during every trial, but more force was required on some surfaces than on others.)*

*On which surface was the inertia (an object's tendency to resist a change in motion) the greatest?*

*How does friction affect motion?*

## **EXTEND/APPLY**

1. Have students place the book on top of two pencils. Have students repeat the book-pulling investigation on all three surfaces while the book is resting on the pencils and then record the information on the activity sheet.
2. Discuss:

*Was there more friction or less friction when the books were on the pencils? Why? (Only the pencils touch the surface; therefore, there is less contact with the surface and less friction.)*

*What can you think of that works like the pencils to help move objects?*

*What can you think of that you wear that is designed to increase friction? (sneakers, which allow us to stop more easily)*

Can you think of an animal that uses its mass and the scales on its underbelly to create friction between its body and the ground to help it move? (snake)

## **ASSESSMENT**

Sometimes friction needs to be increased, and sometimes friction needs to be decreased. Sometimes it is desirable, and sometimes it is not. Ask students to think about and explain situations when we need to increase friction and when we need to decrease friction.

Name: \_\_\_\_\_

## GET A GRIP

Record the names of the surfaces you have chosen.

	<b>SURFACE 1</b> _____	<b>SURFACE 2</b> _____	<b>SURFACE 3</b> _____
<b>Part 1:</b> Describe each surface by observing with a hand lens and by rubbing your hands over the surface.			
<b>Part 2:</b> Predict which surface will produce the most friction and which surface will produce the least friction by numbering from 1 – 3.			
<b>Part 3:</b> Measure the amount of force in newtons required to move the object across the surface.			