

## STICKY SNEAKERS

### Pre-Lab Questions

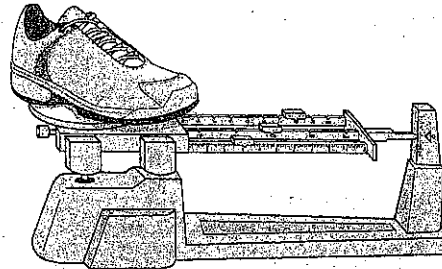
1. Identify three situations that depend on friction.
2. Identify three situations in which decreasing friction is desirable.

PRE LAB

# Sticky Sneakers

## Reviewing Content

No surfaces are perfectly smooth. When two surfaces are in contact, there is always some resistance to one surface sliding over the other. This resistance is a force called friction. Two factors determine the amount of friction between two surfaces. One is the properties of the surfaces—what they are made of and how rough or smooth they are. The other factor is how much force is pressing the surfaces together. In order to compare the friction of various objects on a surface, it is important that the objects be pressed on the surface with equal force.



In this lab, you will test various brands of sneakers, making certain that the shoes you are using are of equal mass. Sneakers are designed to deal with various frictional forces, such as:

- starting friction, which is involved when you start from a stopped position.
- forward-stopping friction, which is involved when you come to a forward stop.
- sideways-stopping friction, which is involved when you come to a sideways stop.

## Reviewing Inquiry Focus

When you interpret data, you analyze the data, including measurements and observations. Then you draw conclusions based only on the data you observed. If you make a hypothesis first, you should determine whether or not your data support the hypothesis. Your determination may show that you need to collect more data, collect different data, or change the experiment in some way. In science, you must limit your interpretations to the actual data collected and not make assumptions beyond the data observed.

With these statements in mind, preview the Lab Investigation. Then answer the questions in the spaces provided.

1 What quantities will you measure in the lab? What are the units you will use when you collect data?

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2 You will measure the mass of the shoes. How will you know if the shoes have equal weight? Explain.

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# Sticky Sneakers

## Problem

How does the amount of friction compare among different sneakers and surfaces?

INQUIRY FOCUS  
Interpret Data

### Materials

three or more  
different brands  
of sneakers  
two spring scales,  
5-N and 20-N,  
or force sensors  
mass set  
masking tape  
3 large paper clips  
balance

### Procedure

1. Choose three sneakers to test. Use a piece of masking tape to label them A, B, and C.
2. Use the data table to record each type of friction for each shoe.

### Data Table

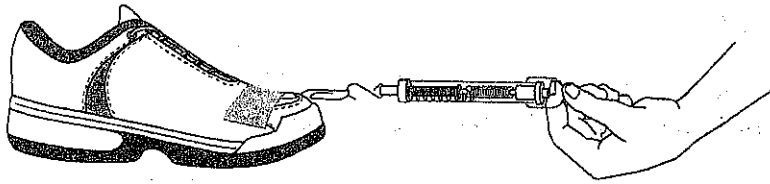
Sneaker	Starting Friction (N)	Sideways- Stopping Friction (N)	Forward- Stopping Friction (N)
A			
B			
C			

3. Place shoe A on the balance. Then place masses in the shoe so the total mass of the shoe plus the masses is 1000 g. Spread the masses out evenly inside the shoe.
4. Repeat Step 3 for shoes B and C.

STICKY SNEAKERS *continued*

**DIRECTED** Inquiry

Lab Investigation



5. Tape a paper clip to each shoe and then attach a spring scale to the paper clip. Bend the paper clip as needed so that you can pull the shoe with the scale. (Note: If you are using force sensors, ask your teacher for instructions.)

To measure:

- starting friction, attach the paper clip to the back of the shoe.
- forward-stopping friction, attach the paper clip to the front of the shoe.
- sideways-stopping friction, attach the paper clip to the side of the shoe.

6. To measure starting friction, pull the shoe backward across the lab tabletop or the floor until it starts to move. Use the 20-N spring scale first. If the reading is less than 5 N, use the 5-N scale. The force necessary to make the shoe start moving is equal to the frictional force. Record the starting frictional force in your data table.
7. To measure both types of stopping friction, use the spring scale to pull each shoe at a slow, constant speed. Record the stopping friction forces in your data table.
8. Repeat Steps 5–7 for the remaining shoes.

## Analyze and Conclude

- 1 **Interpret Data** Which shoe had the most starting friction? The most forward-stopping friction? The most sideways-stopping friction?

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- 2 **Control Variables** What are the manipulated and responding variables in this experiment? Explain.

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- 3 **Observe** Why is the reading on the spring scale equal to the force of friction in each case?

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- 4 **Draw Conclusions** Do you think that comparing shoes with a small amount of mass in them is a fair test of the friction of the shoes? Explain.

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- 5 **Infer** Why did you pull the shoe at a slow speed to test for stopping friction? Why did you pull a shoe that wasn't moving to test starting friction?

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- 6 **Develop a Hypothesis** What is the relationship between the brand of sneaker and the amount of friction you observed? What did you observe that might cause one shoe to grip the floor better than another?

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