

# 12-4 What is friction?

## Objective

Identify examples of friction.

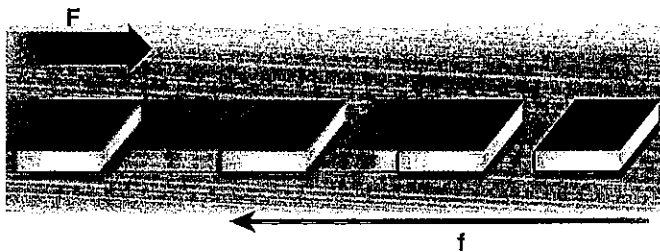
## Key Term

**friction:** force that opposes the motion of an object

**Forces and Motion** To stop a moving object, a force must act in the direction opposite to the direction of motion. If you give your book a push across your desk, the book will move. The force of the push moves the book. As the book slides across the desk, it slows down and stops moving.

- 1 OBSERVE:** Give your textbook a slight push across your desk. What must you do to keep the book moving?

**Friction** A force that opposes the motion of an object is called friction. Look at Figure 12-14. At first, the book is at rest. A push ( $F$ ) causes the book to start sliding across the desk. As the book slides across the desk, a force of friction ( $f$ ) acts in the opposite direction. The friction slows the motion of the book. Finally, the book is once again at rest.



▲ Figure 12-14 What force slows the moving book?

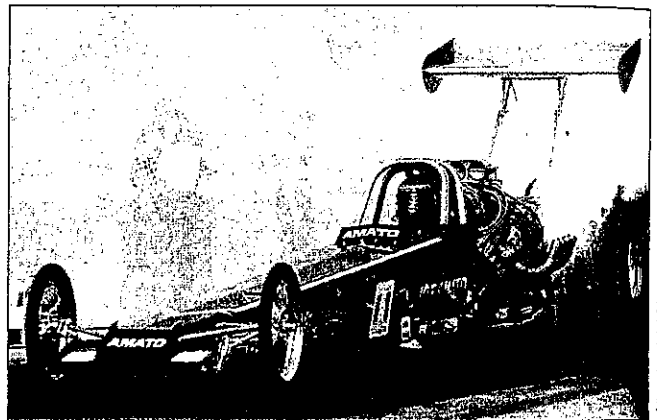
- 2 DEFINE:** What is friction?

**Types of Friction** There are different types of friction. A book sitting on a desk has static friction. This is the force that must be overcome to start the book moving. A book moving across the desk is an example of sliding friction. As the book slides across the desk, the bottom of the book is touching the desk. The source of the friction is the contact between the surface of the book and the desk. Air

resistance is a type of friction. As an object falls, air resistance pushes up on the object. When you ride a bicycle, the contact between the tires and the road is an example of rolling friction.

- 3 STATE:** When does friction occur?

**Useful Friction** On Earth, friction makes motion possible. When you ride a bicycle, the friction between the road and the bicycle wheels is necessary to keep the bicycle in motion. Without friction, you would not be able to stop the bicycle. You would not be able to climb a rope, throw a ball, or even walk down the street. Pencils would not work, and kites, birds, and airplanes would not be able to fly. As you can see, life without friction would be very different and very difficult.



▲ Figure 12-15 Drag racers depend on friction between their tires and the track.

- 4 LIST:** Name several activities that would not be possible without friction.

**Harmful Friction** Sometimes friction is not helpful. For example, think about trying to ski down a hill covered with grass instead of snow. You might be able to do it, but friction between the grass and the skis would make it a slow, bumpy ride.

Unwanted friction can also be found in machines and engines. Many machines have moving metal parts that touch. The rubbing together of these parts produces heat and can cause parts to wear out.

- 5 EXPLAIN:** Why is it sometimes useful to reduce friction?

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### Lesson Review

**PART A** Complete the following.

1. What is sliding friction? \_\_\_\_\_  
\_\_\_\_\_
2. What is air resistance? \_\_\_\_\_  
\_\_\_\_\_
3. What is rolling friction? \_\_\_\_\_  
\_\_\_\_\_

**PART B** Decide which kind of friction has the greatest effect in each situation in the table below. Place a check mark in the correct column.

Situation	Sliding Friction	Air Resistance	Rolling Friction
1. Riding a skateboard			
2. A raindrop falling			
3. A leaf falling			
4. Pulling a wagon			
5. A wheelchair moving			
6. Pushing a book off a shelf			
7. Writing with a pencil			

### Skill Challenge

**Skills:** organizing, classifying

List five examples of friction that affect you in everyday life. Classify each type of friction as *sliding friction*, *air resistance*, or *rolling friction*. Organize your information in a table.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_