16 FRICTION FORCES

Friction is the unseen force that affects nearly everything we do! From walking to driving and even holding a pencil, friction plays a huge role in our everyday lives. In this lesson, we'll explore how friction works, the different types of friction, and how it can be both helpful and unhelpful in the world around us.

Recommended Reading

- *Physics for Curious Kids,* by Laura Baker, pp. 16-19
- *The Magic School Bus Plays Ball: A Book About Forces,* by Joanna Cole
- *Why Do Moving Objects Slow Down? A Look at Friction,* by Jennifer Boothroyd

ACTIVITY Ramp Races: Exploring Friction

Today you'll explore how different surfaces affect the movement of a toy car by testing friction on various materials. You'll discover which materials create the most resistance and which allow for the smoothest ride. Get ready to race and find out which surface wins the friction challenge!

SUPPLIES

- Ramp: a smooth board at least 3 to 4 feet long and 6 to 12 inches wide
- Several books
- Sandpaper
- Felt
- Aluminum foil
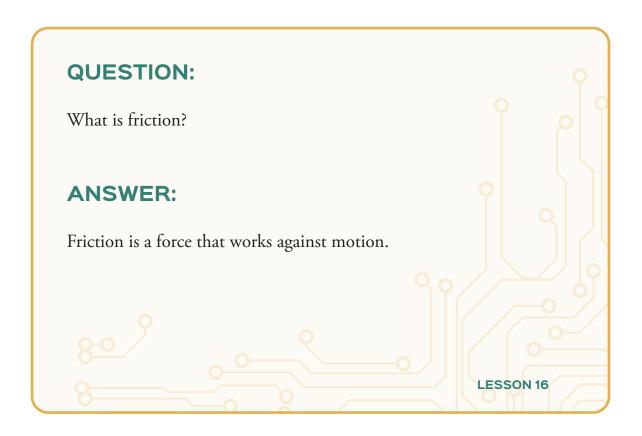- Wax paper
- Tape
- Toy car
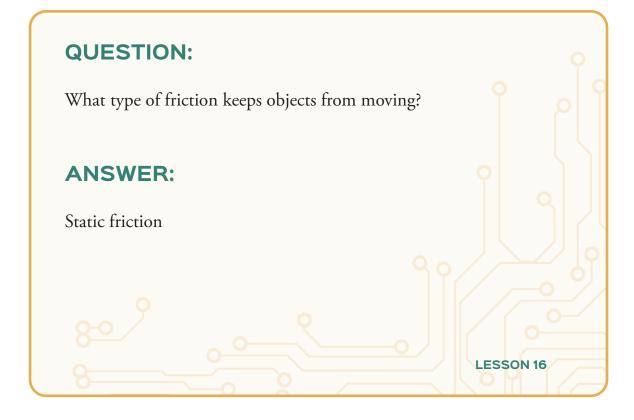- Tape measure or ruler

INSTRUCTIONS

1. Form your hypothesis.

   a. Before starting the experiment, predict which material will cause the most friction and which will cause the least friction.

   b. In the table below, rank the materials (sandpaper, felt, aluminum foil, and wax paper) from 1 to 4, with 1 being the least friction and 4 being the most friction.

2. Place the ramp on a smooth surface. Elevate one end of the ramp using books about 6-8 inches. Ensure the ramp is stable.

3. Test your cars out, rolling them down the ramp. Choose the one that rolls the smoothest and straightest.

4. Attach one of the surface materials (sandpaper, felt, aluminum foil, or wax paper) along the entire length of the ramp using tape.
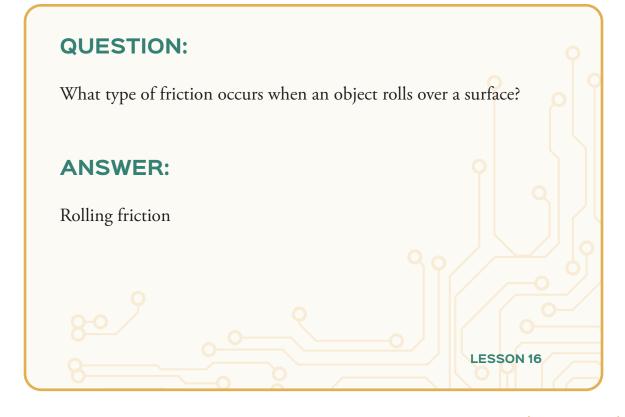
5. Conduct tests:

    a. Place the toy car at the top of the ramp. Release it without pushing.

    b. Observe how far the car travels after it leaves the ramp and measure the distance using a tape measure or ruler.

    a. Record the distance in the table below.

6. Replace the material on the ramp with a new one and repeat the test for each of the materials.

7. Analyze your results.

    a. The longer the distance the car traveled, the less friction the surface created. The shorter the distance the car traveled, the more friction it caused.

    b. Based on your observations, rank the materials from 1 (least friction) to 4 (most friction) and record your rankings on the table.

Surface	Hypothesis (rank 1-4)	Distance traveled	Results (rank 1-4)
Sandpaper			
Felt			
Aluminum foil			
Wax paper			

QUESTION:

What is friction?

ANSWER:

Friction is a force that works against motion.

LESSON 16

QUESTION:

What type of friction keeps objects from moving?

ANSWER:

Static friction

LESSON 16

QUESTION:

What type of friction occurs when two objects slide past one another?

ANSWER:

Sliding friction

QUESTION:

What type of friction occurs when an object rolls over a surface?

ANSWER:

Rolling friction

A gem cannot be polished without friction,

nor a man perfected without trials.

A gem cannot be polished without

friction, nor a man perfected without

trials.

Lesson 16 Quiz

1. What is friction?

A) A force that helps objects speed up
B) A force that works against motion
C) A type of energy
D) A force that causes objects to stay in motion forever

2. Friction always works in the same direction as the motion of an object.

A) True
B) False

3. A soccer ball moving across the field is an example of which type of friction?

A) Static friction
B) Sliding friction
C) Rolling friction
D) Fluid friction

4. A skydiver falling through the air, experiences what type of friction?

A) Static friction
B) Sliding friction
C) Rolling friction
D) Fluid friction

5. A book sitting on a table is an example of what type of friction?

A) Static friction
B) Sliding friction
C) Rolling friction
D) Fluid friction

6. What type of friction are you creating when you rub your hands together to create heat?

A) Static friction
B) Sliding friction
C) Rolling friction
D) Fluid friction

7. Friction is never helpful, because it always slows things down.

A) True
B) False

8. When there is less friction, objects move more easily and faster.

A) True
B) False