SCIENCE

Lesson 10

Year 4

Topic: Exploring forces

Exploring friction

Today you will:

- understand the main types of friction
- understand how friction acts on an object.

Resources

Find and prepare

Medium to large sturdy cardboard box
Books (or similar heavy items, for example: wooden blocks)
Four sports markers or cones
Item with wheels that can carry the box, for example: skateboard
Two plastic cups
Eye-dropper
Water
Vegetable oil
Hand wipes
Exercise book

Key terms

friction, motion

For definitions and explanations of terms, please see the Glossary.

Lesson

Review friction



When you rub your shoes across the floor, you feel friction. **Friction** is a force that acts between two objects and opposes motion.

Motion is the change in the position of an object caused by an applied force.

During this lesson, you will explore the effects of friction by participating in some simple activities. Think about friction when conducting the activities.

1. Rub your shoes quickly across the floor.
2. What force is being exhibited?

3. Write your definition of friction.

Explore types of friction including sliding and rolling



Hot tip

A concreted area and a grassed area are required for these activities. Always have a supervisor when moving outside to conduct activities. Wear a hat and sunscreen for sun protection. Stay away from roads and hazards. A concreted space for the activity can include a path or undercover area.

4. Gather the equipment needed for 'Friction activity 1' and follow the instructions.

Friction activity 1

Equipment

Medium to large sturdy cardboard box

Books (or similar heavy items, for example: wooden blocks)

Four sports cones or markers

Instructions

1. Half fill the box with books to add weight.
2. Use two markers to indicate a start line and then place the other two markers at the finish line, which is 4 m away.
3. Use your hands to push the box across concrete for the 4 m.
4. Next, use your hands to push the box across grass for 4 m.

5. Answer the following questions. Write down your answers or discuss them with another person.
   a. Was it easy or hard to push the box across the concrete? Why?

   b. Was it easier or harder to push the box across the grass?

   c. Why do you think they were different?

   d. Would it be easier to pull the cardboard box?

6. Gather the equipment needed for ‘Friction activity 2’ and follow the instructions.

Friction activity 2

Equipment

Medium to large study cardboard box

Books (or similar heavy items, for example: wooden blocks)

Item with wheels that can carry the box (for example: a skateboard)

Instructions

1. Place the cardboard box from ‘Friction activity 1’ on the wheeled item and push it across the concrete for 4 m (marked out previously).
2. Next, use your hands to push the box across grass for 4 m.

7. Answer the following questions. Write down your answers or discuss them with another person.

   a. Was it easy or hard to push the wheeled item across the concrete? Why?

   b. Was it easier or harder to push the wheeled item across the grass?

   c. Why do you think they were different?

8. Gather the equipment needed for 'Friction activity 3' and follow the instructions.

Friction activity 3

Equipment

Two plastic cups
Eye-dropper
Water
Vegetable oil
Hand wipes

Instructions

1. Quarter fill one cup with water.
2. Quarter fill one cup with vegetable oil.
3. Rub your hands together quickly for 30 seconds.
4. Use the eye-dropper to add some drops of water to your hands and rub them together again, for 30 more seconds.
5. Next, add some drops of oil to your hands and rub them together for a third time.

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9. Answer the following questions. Write down your answers or discuss them with another person.

   a. What happened when you rubbed your hands together with no liquid on them?

   b. What happened when you repeated the activity with water on your hands?

   c. What happened when you added the oil to your hands and rubbed them together?

   d. Which way was easiest?

   e. Did you notice anything happening while you were rubbing your hands together?

Define types of friction

There are three types of **friction**: sliding friction, rolling friction and fluid friction.

Sliding friction:

- occurs when two objects slide past one another, such as the box and the floor
- occurs because the whole of the box is in contact with the floor when it moves.

Rolling friction:

- occurs when an object with wheels moves across a surface, such as the wheeled item and the ground
- involves only the bottom of the wheels touching the surface when they move.

Fluid friction:

- occurs when an object moves through a liquid, such as water, or a gas, such as air
- can be seen when planes or parachutes move through the air, or when a boat moves through water.

10. Write some examples of sliding friction, rolling friction and fluid friction.

Sliding friction	Rolling friction	Fluid friction

Elaborate on friction



When you were conducting your friction activities, you were working against friction from the ground, as well as working against friction from the air.

Think about how much harder the activities would have been if you had to work against a strong wind.

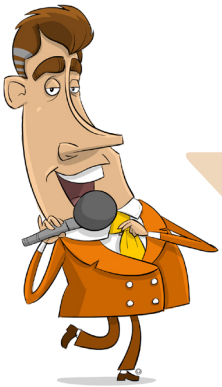
Friction acts on an object in a number of ways at the same time.

11. Look at the force diagram of the parachute falling through the air.



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It is the friction from the air that assists the parachute to slow the descent of the parachutist towards Earth.



Hmmm. The friction activities have given me an idea for a game with shuttle runs! Competitors will run between markers, but we need to make it harder to be in *60-second slam*. I wonder, would covering the floor with a slippery substance reduce friction and slow competitors down?

12. Is the use of science required to answer this question?

a. Yes ☐ No ☐

b. Why/why not?