Lesson 10

Topic: Exploring forces

Exploring friction

Lesson concepts

- Forces can be exerted by one object on another through direct contact
- Science involves making predictions
- Science knowledge helps people to understand the effect of their actions
- Appropriate materials, tools and equipment should be used safely to make and record observations
- Ideas and findings can be represented and communicated

Learning alerts

Be aware of students thinking that friction always hinders motion, and so reducing friction is always desired.

Suggested next steps for learning:

Remind students that, without friction, a range of movements would not be able to occur. For example: walking requires friction between the floor and foot.

Lesson notes

In this lesson, students will understand the main types of friction and how friction acts on an object. Students will need to conduct some friction activities inside and outside.

Safety

- Identify safety issues relevant to hazards in the environment and conduct relevant risk assessments.
- Ensure sun-safe practices when working outside.

Lesson answers

1. No answer required.
2. Friction.
3. For example: Friction is a force that opposes motion; it results when two objects rub against each other, when one or both are moving.
4. No answer required.
5. a. For example: It was hard to push the box across the concrete because it was heavy and full of books. It was easier to push once I had started to move the box. (**Note:** Answers will vary depending on the size of box, weight of books, surface of concrete and strength of student.)

b. For example: It was harder to push the box across the long grass than the smooth concrete. (**Note:** If the grass is on flat ground and is very short and smooth, and the concrete is uneven and coarse, students may find it easier to push the box over the grass than the concrete.)

c. For example: The smooth surface of the concrete made pushing the box easier than over the long grass.

d. For example: It is easier to push the box because there is a bigger area to push against; it is easier to pull the box because the box has a handle on the front and is easily gripped.

6. No answer required.

7. a. For example: It was easy to push the wheeled item over the concrete.

b. For example: It was harder to push the wheeled item over the grass.

c. For example: It was easier to push the wheeled item over the concrete because the concrete was smooth, and the grass was rough. The wheels got caught on clumps of grass and then fell into holes.

8. No answer required.

9. a. For example: It was hard to rub my hands together, they kept gripping against each other and they got hot.

b. For example: It was easier to rub my hands together with water on them, but the water dried quickly and then it was hard to rub them again.

c. For example: It was easiest to rub my hands when they had oil on them. My hands were really slippery and they rubbed against each other easily.

d. For example: It was easiest to rub my hands together when they had oil on them.

e. For example: My hands got hot when I rubbed them together without anything on them.

10. For example:

Sliding friction	Rolling friction	Fluid friction
Pushing boxes across the floor	Pushing a supermarket trolley	Surfboard on the ocean
Opening a sliding glass door	Toy truck on the floor	Parachute falling through air
Ironing your clothes	Skateboard on the road	Submarine through water

11. No answer required.

12. a. Yes.

b. Science knowledge of friction is needed to answer the question. Reducing the friction would make competitors move more quickly, but they would not be able to get a grip on the floor so they would fall over more frequently. This would make them slower.

Queensland Government

Lesson 11

Topic: Elaborating on forces

Investigating force and motion of everyday objects

Lesson concepts

- Forces can be exerted by one object on another through direct contact or from a distance
- Science involves describing relationships
- Science knowledge helps people to understand the effect of their actions
- Appropriate materials, tools and equipment should be used safely to make and record observations
- Data is represented and used
- Ideas and findings can be represented and communicated

Learning alerts

Be aware of students thinking that friction doesn't affect wheels.

Suggested next steps for learning:

Inform students that friction occurs where the wheel makes contact with the ground and the object/vehicle as a whole is affected by the friction of air.

Lesson notes

In this lesson, students will understand the effect of an applied force on the motion of objects.

Lesson answers

1. For example: Running, playing sports, swimming, jumping, walking.
2. No answer required.
3. No answer required.
4. No answer required.
5. **Sheet 8 — Design a forces poster** (attached).
6. No answer required.
7. For example: Hitting the ball with the club applies a force that is strong enough to overcome the opposing force of friction between the ball and the grass and the ball moves forward. If a strong push force is applied to the ball, it will travel a long distance. If a small push force is applied to the ball, it will travel a short distance.

Lesson 12

Topic: Elaborating on forces

Games from other cultures

Lesson concepts

- Forces can be exerted by one object on another through direct contact or from a distance
- Science knowledge helps people to understand the effect of their actions
- Ideas and findings can be communicated

Learning alerts

Be aware of students thinking that games only involve contact forces.

Suggested next steps for learning:

Remind students that the non-contact force of the pulling force of Earth is also involved in all the games.

Lesson notes

There is much to know and learn about Aboriginal peoples' and Torres Strait Islander peoples' histories and cultures. Participating in Aboriginal peoples' and Torres Strait Islander peoples' ways of learning and knowing will be an exciting experience. This will be a journey of discovery in new ways of learning, new knowledge and new and interesting texts.

General information

- This lesson is aimed at demonstrating games from other cultures.
- For the Chinese game Shuttlecock, source a modern shuttlecock or make one following the instructions on the next page.
- For the Japanese game *kendama*, as an extra activity, students could make their own kendama if time permits. Instructions to make a kendama are provided on the next page.
- The Maori game *ki-o-rahi* is included here as an example only, and is not intended to be played in this lesson.
- Search for other traditional, cultural games on the internet by using terms such as 'traditional games' and the country you are interested in learning about.
- Many websites have rules, diagrams and instructions on games and toys used.

Traditional Australian Indigenous games

- These games are adapted from the **Website — Yulunga: Traditional Indigenous games** (Australian Sports Commission) https://www.sportaus.gov.au/yulunga
- Equipment can be substituted.

Queensland Government

Suggested equipment substitutions	
game	**substitute**
kai	balloons, foam balls, bean bags
kai wed	beach balls; large, light plastic balls
nandrra-rna	counters
yangamini	counters, coins, bean bags students aim at a circle on the ground instead of a hole

Practical information

Making a shuttlecock

- You need four feathers, stiff cardboard and a 20c coin.
- Cut out two 20c-sized pieces of cardboard.
- Tape the four feathers to the coin at the compass points N, S, E, W. The feathers need to point upwards (not flat).
- Cover each side of the coin with a piece of cardboard and tape securely.

Making a *kendama*

- You need a polystyrene cup, a piece of string at least 30 cm long and a table tennis ball or ball of aluminium foil.
- Tape the string to the table tennis ball or ball of aluminium foil.
- Poke a hole in the bottom of a polystyrene cup.
- Thread the other end of the string through the hole and tie a knot, so the ball is hanging from the string at the bottom.
- Flick the ball into the cup.



Kendama with ball on top, Gloria Populorum, http://commons.wikimedia.org/wiki/File:Kendama_frontal.JPG

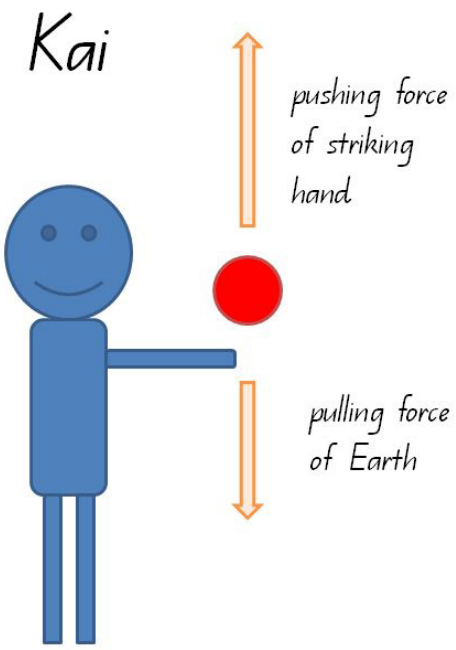
Safety

- Consider the environment surrounding the activity and the availability of free space.
- Materials used for games should be clean and free of sharp edges.

Lesson answers

1. No answer required.
2. The forces involved are the push from the striking hand, the pulling force of Earth, air resistance (friction) and the pushing force up from Earth if the ball falls down.
3. No answer required.

4. For example:



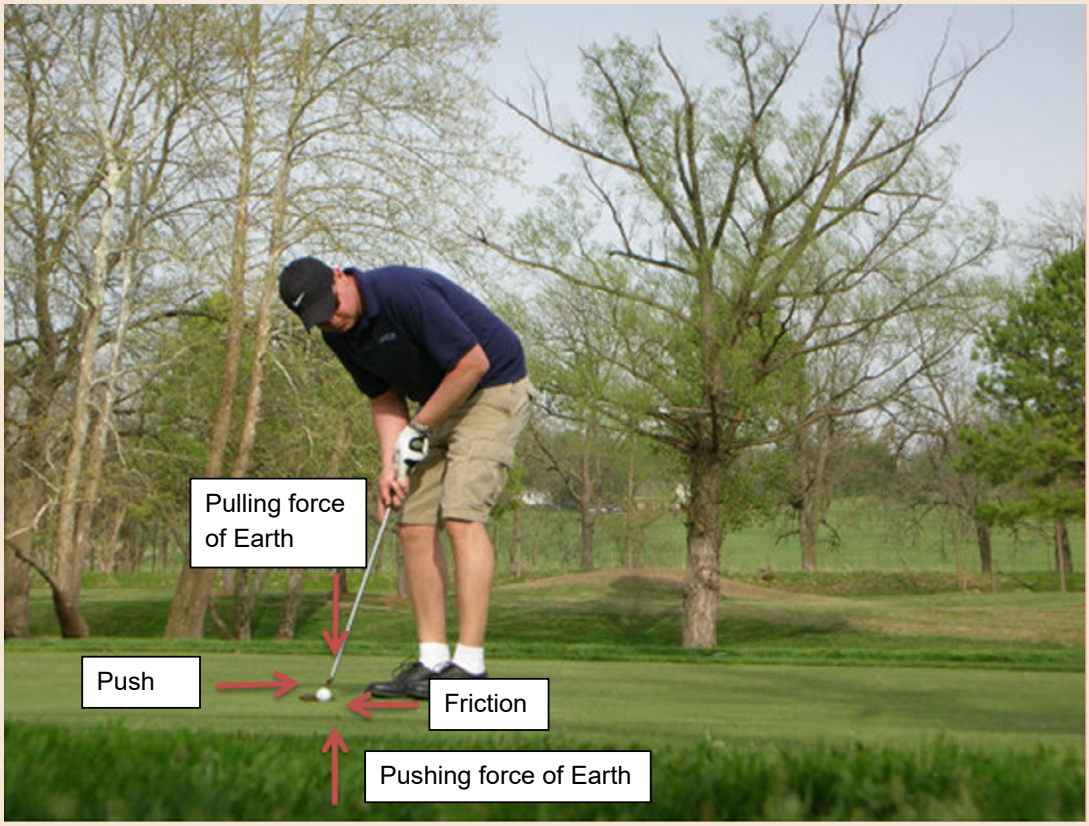
5. No answer required.

Queensland Government

Design a forces poster

Sheet 8 Answers

Draw your everyday forces poster here or on a piece of card.



http://www.morguefile.com/archive/display/115350

The force required to make the golf ball move is called **push**.

A golf ball is used in the game 'golf'. Players use a golf club to hit the ball with the goal of getting it into a hole. The player who can get the golf ball around the course with the least amount of strikes with the golf club is the winner.

When a pushing force from the club is applied to the ball, it moves forward when friction is overcome. The amount of push force required to move the ball depends on how far the ball needs to go. If the hole is close, the player needs to apply only a small amount of push force to the ball to overcome the friction and move the ball a short distance.

Another factor that may affect the motion of the golf ball is the condition of the green. The green may be long grass, freshly mowed grass, covered in water or dew. If the ball is in longer grass, the player will need to apply more force to the ball to overcome the friction from the grass and move the ball the required distance. If the ball is on a smoother surface, like freshly mowed grass, it will require less push force to overcome the friction and move the ball.