4.1. How forces act

When we drop a book, it falls to the ground. Gravity pulls all objects downwards, but can forces act in other directions?

What forces can you identify in the picture?

Forces always act in pairs that work in opposite directions. If you are holding an object in the air, you are exerting an upward force on it, but the object is also exerting a downward force. If the forces are the same size, they are said to be balanced. If one force is bigger than the other, they are said to be unbalanced. When forces are balanced, an object will remain stationary. If forces are unbalanced, one object will move in the direction of the force.

Forces acting on a bicycle

Look at the picture of the boy on the bicycle. Draw arrows on the picture to show the direction of the forces acting on the bicycle.

Balanced and unbalanced forces

In this exercise, you will consider balanced and unbalanced forces: Look at the picture and underline the correct words to make each of the sentences true.

1) The forces shown are pushing / pulling forces.
2) The forces shown are working together / opposite forces.
3) The forces are equal / not equal.
4) The forces do / do not balance each other.
5) The bigger force is pulling to the right / left.
6) The smaller force is pulling to the right / left.
7) Movement is to the right / left.

Draw a force diagram to show the forces acting in the picture.

What can forces do?

Forces can make things move. When you exert a force on a ball by blowing or rolling it, you make the ball move. Forces can also speed up moving objects.

Forces can also slow down moving objects or make them stop. When the ball rolls into the book, it stops moving. The book exerts a force on the ball to stop it.

Forces can change the direction in which an object moves. When you flick the ball from person to person, it changes direction each time. Each person exerts a force on the ball changes the direction of the ball's movement.

Forces can change the shape of an object. When you squeeze a ball, you exert a force on it. The force makes the ball change shape. Forces that change the movement or shape of an object are unbalanced forces.

4.2. The effects of forces

In each of the following examples, identify the effect of the force on the object. Choose from:

- Makes an object move.
- Changes the direction of a moving object.
- Changes the shape of an object.
- Changes the speed of an object.

Jim pedals her bicycle faster.

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Emma cracks an egg into a bowl.

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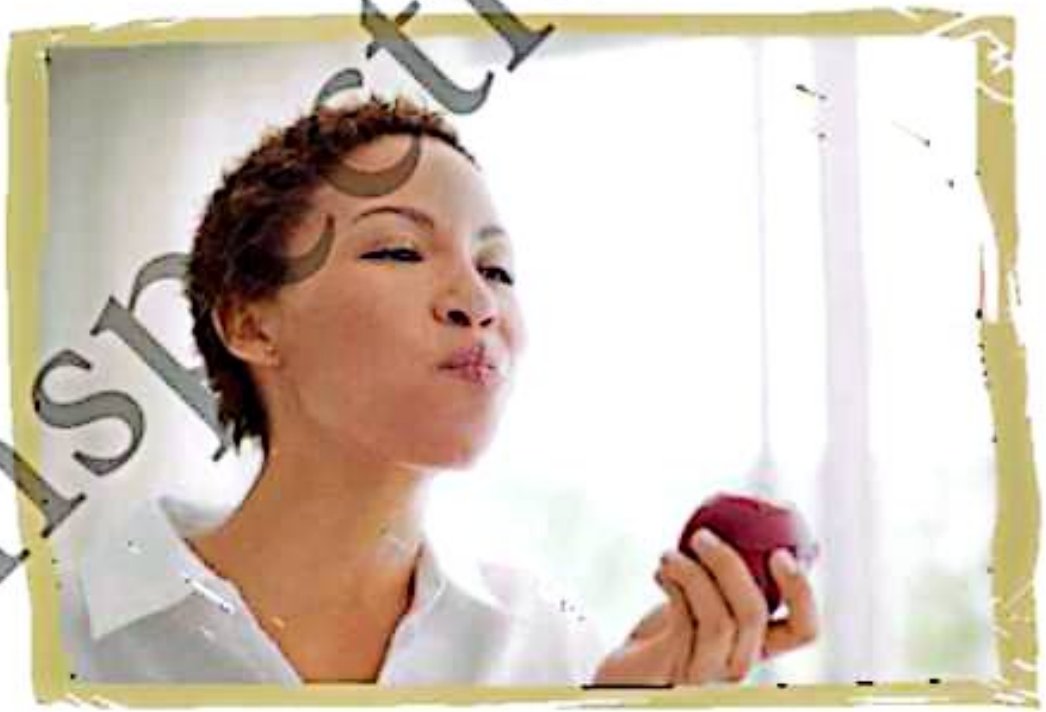
Jane pushes open a door.

.....

Roger hits the tennis ball back to Rafael.

Celine chews a piece of apple.



4.3. Friction

What is friction?

Rub your hands together for 30 seconds.
How do your hands feel? Are they warmer?

Friction is a force which tries to stop things sliding past one another. It is caused when two surfaces rub together.

Friction only acts on moving objects and it cannot make objects move. Friction slows down moving objects. It changes the energy of moving objects into heat energy as the objects slow down.

Explain why friction is useful.

Read these sentences about friction. Underline the correct words to complete the sentences.

a) Friction is caused when two surfaces rub / stick together.

b) Friction can / cannot make an object move.

c) Friction speeds up / slows down moving objects.

d) Friction changes heat / movement energy into heat / movement energy.

e) Friction helps objects slide / grip on surfaces.