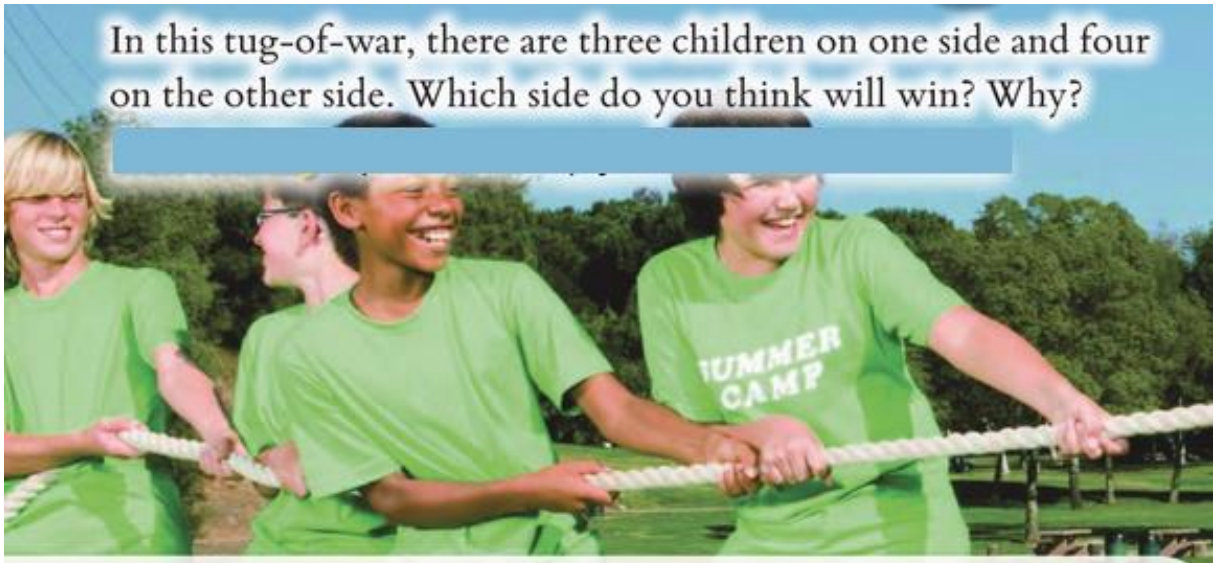
A force is something that changes the movement of something else or changes the shape of something else. For example, when you push a cart, you put force on the cart to make it move. When you squeeze a piece of soft clay, the force you put on it changes the shape of the clay.

Many forces affect the speed of a moving object. When you roll a ball across a rug, the friction, or rubbing, between the ball and the rug acts against the movement of the ball. So, it slows the ball down.

Mechanical forces act when objects touch each other. Your body uses mechanical force when you pedal a bicycle or kick a ball.

Other kinds of forces act without touching objects. Instead, they act from a distance and cannot be seen. Gravity is this kind of force. It pulls everything toward the centre of Earth.

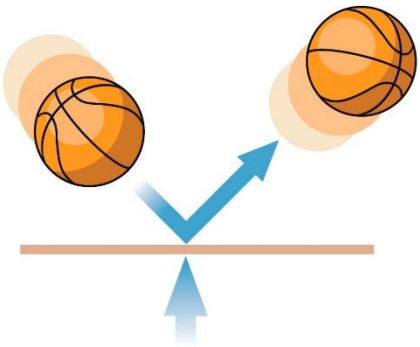
Sometimes more than one force acts on an object at the same time. When two people push a broken-down car, they use a force to overcome the friction between the road and the tyre. So, the car moves forward. When you sit in a chair, gravity pulls you toward Earth. But the chair pushes you up, away from Earth. The two forces "cancel" each other out, and you stay still.



In the tug-of-war, each side is pulling on the rope but in opposite directions. Pulling on the rope involves exerting a force. For a while, the two sides pull with similar force. Because the forces in either direction balance each other, the rope doesn't move in either direction. For one side to win, its members must pull with greater force. If one team has more members, it's likely that it can pull with more force and win the tug-of-war.

As you've seen, a pull is a **force**. A force can also be a push. A person pushing a shopping trolley is applying a force to the trolley. This force is what causes the shopping trolley to move.

You can click on the picture below to watch a video showing how some of these forces work:



Gravity MATTERS!

Have you ever ridden on a rollercoaster? What force moves the rollercoaster on the downward parts of the track?

Active Reading As you read this page, draw a line under three sentences that explain why gravity is a force.

Gravity is an attractive force that the Earth exerts on any object that has mass. It's constantly acting on us, pulling us towards itself. The ground we are standing on pushes us back in the other direction. Gravity is not strong enough to overcome this – if it was, we would disappear into the Earth!

A famous scientist named Galileo was one of the first people to help us understand gravity. In 1589 he did a famous experiment where he dropped two objects of different mass from a tower in Italy. He discovered that the two objects took the same time to land on the ground. He concluded that gravity caused all objects to fall at the same **speed**. Up until that time, many people thought that heavy objects would fall faster than lighter ones. Galileo showed that this wasn't true!

Because the ground pushes back on objects, gravity can't pull them through the Earth. However, objects in water are a different matter! Some objects do remain on the water's surface. Gravity is pulling these objects towards Earth, but the force of the water pushing up balances the force of gravity pulling down. We say that these objects float.

Some objects placed in water will sink through the water. As with objects that float, gravity is also pulling these objects towards Earth. In this case, however, the force of the water pushing up is not enough to balance the force of gravity pulling down, so these objects sink in water.

The moon's gravitational force is only about one-sixth as strong as Earth's. This is partly due to the fact that the moon has much less mass than Earth. You can jump much higher on the moon than you can on Earth!

Wednesday

Forces Activity A

1. Give four examples of forces:

_____ _____ _____

_____

2. Name two things that a force can change about an object:

A) _____

_____

B) _____

_____

3. Give an example of a time when two forces might cancel each other out:

_____

_____

_____

_____

4. What is the name given to the force that the Earth uses to pull objects towards it?

_____

_____

5. Give an example of a time when you have seen this force in action:

_____

_____

_____

_____

6. If an object is placed in water and the force of the water pushing it up is <u>less</u> than the force of gravity what will happen?

_____

_____

_____

_____

7. Draw an example of each of these forces:

push	pull	friction

Thursday/Friday

Forces Activity B – Experiment Time

This experiment is going to look at the effect of gravity on different objects and try to understand the reasons why this effect might be different for some objects.

You will need:

- 3 Sheets Of Paper The Same Size
- A Coin

What To Do:

1) Take 2 of the sheets of paper and scrunch them up into balls that are both the same size.

2) With your hands held at the same height, you are going to drop two objects at a time (you don't need to be up on a chair or table or anything for this – just standing on the floor is fine!):

    a) First the 2 balls of paper
    b) Then one ball of paper and the coin.
    c) Then the 3rd sheet of paper (not scrunched into a ball) and one of the paper balls

3) Before you start dropping, fill in the prediction section on the next page.

4) Now try each drop. Do each one 3 times so you get more accurate results. Each time after you drop two of the objects, check which one hits the ground first. You might need someone to help spot this for you. Then in the experiment record on the next page put a tick in the box to show the result.

5) Draw a labelled picture of how you did the experiment on your experiment sheet and fill in the results and conclusion sections.

My Experiment Record

My Prediction (Circle The Red, Green Or Blue Words):

In a) I think the two balls of paper will/will not hit the ground at the same time.

In b) I think the ball of paper will hit the ground first before/after/at the same time as the coin.

In c) I think the flat sheet of paper/ball of paper will hit the ground first.

Experiment Record

a) Drop these pair of objects from the same height 3 times. Tick which hit the ground first each time:

Ball Of Paper 1	Both At The Same Time	Ball Of Paper 2

b) Drop these pair of objects from the same height 3 times. Tick which hit the ground first each time:

Ball Of Paper	Both At The Same Time	Coin

c) Drop these pair of objects from the same height 3 times. Tick which hit the ground first each time:

Flat Sheet Of Paper	Both At The Same Time	Ball Of Paper

Diagram Of How I Did My Experiment:

Results And Conclusion

Did any objects hit the ground at the same time? Which ones?

Which object was slowest to hit the ground?

Why do you think this was?

Click here to learn a little bit more about why this might have happened.