

Empiribox KS2 Preliminary Activities - Forces

Gravity



This activity should encourage pupils to understand the effect of a force and know that objects fall towards the Earth because of the gravitational force. ***The force of gravity causes objects to fall towards the Earth.***

Remind pupils that a force can change the motion of an object; it could cause it to move, to get faster or slower or change direction.

When an object is dropped, it falls faster towards the ground. Allegedly, when an apple fell from a tree and knocked Isaac Newton on the head, he realised that there was a force acting between the Earth and the apple. This force causes objects to be pulled towards the (centre of the) Earth. Gravity does not just cause objects to fall towards Earth, it also responsible for holding objects on the ground. Astronauts float due to the lack of gravity in space.



It is difficult to observe that the force of gravity causes objects to accelerate, as objects in freefall drop so quickly. This activity demonstrates that gravity does cause objects to accelerate.

Find a high window to drop a tennis ball (or other brightly coloured ball) from.

The ball will appear to move quicker as it falls. This is because it is accelerating; the force of gravity affects its motion.

Ask children what will happen if you drop a book and a piece of paper at the same time? Which will fall fastest? Gather ideas and encourage children to support their ideas with reasons.

Explain to children that everything on Earth actually falls at the same rate. The reason why a feather appears to fall more slowly than a hammer is due to air resistance. However, objects do not fall at the same rate all over the universe.

Show the pupils footage of Gene Cernan (Apollo 17) bunny hopping on the moon:

<https://www.youtube.com/watch?v=HY-Vxi4YwSY>. Pupils will notice that Cernan falls back to the ground more slowly than he would on Earth. Explain that this is because the moon's gravity weak; 1/6 that of Earth's gravity. This is due to the size of the moon. Smaller bodies have weaker gravitational fields. The sun is so massive that its gravity causes all the planets to orbit it.

Extension:

- ✓ Newton's work on gravitation, forces and motion was published more than 300 years ago in '*Principia Mathematica*' and is the foundation of classical physics. Classical physics still largely holds up today: we used classical physics to put a man on the moon. Children could research the effects of gravity in space.
- ✓ Children could also try dropping a football with a tennis ball on top and watching the effect of the force on both balls. Watch a slow motion video at <https://www.youtube.com/watch?v=Y5jR1E2DPTI>

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Friction

1. Cut up a block of jelly into cubes and place on a paper plate.
2. Ask a child to move each of these cubes to another plate – the challenge being that they can only use chopsticks and must not stab the pieces!
3. Ask children to identify problems and explain how the jelly felt between the chopsticks.
4. Next they need to repeat the challenge, after you have poured some vegetable oil over each cube.



How did the oil effect the challenge?

What changed?

Ask children to explain what effect adding the oil had to the challenge.

Use this activity as an introduction to friction, which could lead into discussions into objects which need friction to improve their performance. Children may make suggestions such as shoes and tyres.

Friction is the resistance of motion when one object rubs against another. Anytime two objects rub against each other, they cause **friction**. **Friction** works against the motion and acts in the opposite direction.

A nice animation to explain friction, can be viewed at:

<https://www.youtube.com/watch?v=C7NPD9W0kro>

