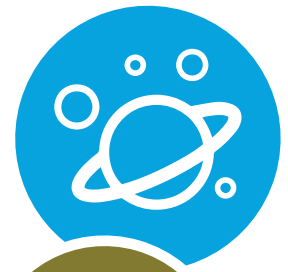


making physics matter



Age  
7-11  
years

# Phizzi practical

## Planetary picnic



### Introduction

The words **weight** and **mass** are often used interchangeably in everyday speech, but in science the two words have very different meanings:

- Weight is the force of gravity on an object and it is measured in newtons (N).
- Mass is how much matter an object contains, and it is measured in kilograms (kg).

In this practical activity, children experience how the force of gravity varies around the solar system by feeling how the weight of a familiar object, a tube of crisps, would change on different planets.

### Scientific explanation

On Earth, the force of gravity pulls objects towards the centre of the Earth. This non-contact force, which we call an object's weight, is what makes unsupported objects fall and what stops us floating up into space! The force of gravity attracts all objects with mass towards each other. The size of this pull depends on the mass of the objects. For an object on Earth, its weight depends both on its mass and the mass of Earth. The bigger each mass, the bigger the pull. As different planets have different masses, the strength of the gravitational pull varies around the solar system. When comparing the force of gravity on different planets, physicists talk about a planet's gravitational field strength. The gravitational field strength tells us the size of the force that will pull a 1kg object towards the planet. The Sun has the strongest gravitational pull in the solar system because it has the greatest mass.

## Method

### Equipment needed

- One full 200g crisp tube (or similar)
- Seven empty crisp tubes (of the same size)
- Sand or rice
- Scales (for measuring in grams)
- Tape
- Labels
- Paper, crayons and stickers to decorate

1. Label the full, unopened can of crisps 'Earth'.
2. Fill each of the other empty tubes with the mass of sand/rice indicated in the table below, seal their lids securely using the tape and label each tube with the name of the planet it represents.
3. Decorate each tube to indicate the planet it represents – a super opportunity to be creative by coming up with a design that symbolises the particular planet. You could develop the activity further by adding interesting facts about the planet to the tube.
4. Children can then lift the tubes to feel how heavy a tube of crisps would feel on different planets; they can compare the planets and think about how heavy they would feel on different planets too.

Planet	Mass of crisp tube (kg)	Gravitational field strength (N/kg)	Weight of crisp tube on each planet (N)	Contents of tube (where the empty tube has a mass of 45g)
Mercury	0.245	3.7	0.907	48g sand/rice
Venus	0.245	8.9	2.18	177g sand/rice
Earth	0.245	9.8	2.40	crisps (200g)
Mars	0.245	3.7	0.907	48g sand/rice
Jupiter	0.245	23.1	5.66	532g sand/rice
Saturn	0.245	9.0	2.21	180g sand/ rice
Uranus	0.245	8.7	2.13	172g sand/rice
Neptune	0.245	11.0	2.7	230g sand/rice

Credit: Gravitational Field Strengths from <https://nssdc.gsfc.nasa.gov/planetary/factsheet/index.html>



Credit: NASA 1

## Is there gravity in space?

One of the most widely held misconceptions in science is that astronauts 'float' around in the International Space Station (ISS) because there is no gravity in space. This simply isn't true! The Earth's force of gravity is pulling the ISS downwards, but the ISS is travelling horizontally at such high speed that it ends up travelling in a huge curved path, never getting closer to Earth. We call this being in orbit.

The weightlessness (microgravity) that the astronauts experience all the time is exactly the same as what we feel (briefly) when going fast over the top of a rollercoaster or humpback bridge.