

What Is Gravity?

Gravity is all around us. Everything that has a mass creates a gravitational pull - even the smallest grain of sand. The larger something is, the stronger its gravitational impact. Believe it or not, your gravitational pull is trying to pull things towards you all the time. Because you don't have a very large mass, it is very weak, and so you don't notice it.

There is an important difference between weight and mass. Weight is the mass of an object in a specific strength of gravity. Mass is how much of something there is. Because most of the things we weigh are on Earth and have the same strength of gravity acting on them, then the difference doesn't matter much. However, if you travelled to a planet with much stronger gravity, you would weigh a lot more. If the gravity was weaker, you would weigh a lot less. However, your mass would be the same no matter which planet you were on.

The gravitational pull of a planet is measured in metres per second, per second (or metres per second squared). This is because it is an acceleration force. Earth's gravity is just over 9m/s^2 . It means that when you are in freefall towards the centre of the Earth (freefall means that there is no air resistance or friction), you speed up by 9 metres per second, every second.

As you move away from the source of gravity, the strength of the force gets weaker. However, with large objects such as planets, you have to get a very long way away to notice an effect. There will be a small difference at the top of the tallest mountains (although not enough to notice), but even when you get into the Earth's orbit, the force isn't that much weaker. Astronauts on the International Space Station are still subject to about 90% of the Earth's gravitational pull. That means it is 90% as strong as it would be on the ground. This isn't enough to allow them to float around in the way that they do, so



what causes that?

It's actually a myth that astronauts in space don't experience Earth's gravity. The Moon is held in the Earth's orbit because of its gravity, so there is clearly a strong force that far out. Instead, astronauts and the Moon are constantly falling towards the Earth in something called freefall. If you've ever been on a rollercoaster or a drop-ride, you will know what it feels like when you fall suddenly. For a split second, you feel like you are floating. The orbit of the ISS and the Moon and anything else in the Earth's orbit means that they are in constant freefall. Effectively, they are held at the moment on the rollercoaster forever. So, far from there being no gravity, the pull of gravity towards the Earth is what is allowing them to float. Without it, they would drift off into space.

Even once you are out of reach of the Earth's gravitational pull, you would still be pulled around by gravity from other planets and stars in the solar system. In fact, you can never truly be out of reach of gravity!

RETRIEVAL FOCUS

1. How strong is the Earth's gravity on the International Space Station?
2. What is the gravitational pull on Earth?
3. Where might you have experienced freefall?
4. Where might there be a small difference in the strength of gravity?
5. Give an example of something that is in the Earth's orbit.

VIPERS QUESTIONS

S

Explain how the gravity of a planet affects how much you weigh.

S

Why are you never free from gravity?

V

True or false: astronauts don't experience Earth's gravity.

V

Find and copy a word that means "in other words".

I

Which fact in the first paragraph might the author be suggesting is surprising?