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EARTH IS BIG

How big is the Earth? The most common way of measuring the size of a planet is to use its diameter, which is the distance from one edge to another running through the centre at the equator. Earth's diameter is 12,756 kilometres. Let's see how some smaller objects compare.

EARTH

Our planet

12,756 km

THE SOLAR SYSTEM

Our solar system contains planets, moons and lots of smaller objects. Some, including planets and dwarf planets, orbit the Sun. Moons orbit planets. Many of these objects are smaller than Earth, including Earth's Moon, our closest neighbour in space.



Fifth largest moon in the solar system • When you compare the size of the Moon to the size of the Earth, it is the largest moon compared to the size of the planet it orbits (excluding dwarf planets).



PLUTO 2,370 km

Dwarf planet • When it was first discovered in 1930, Pluto was labelled as the ninth planet in the solar system. But as scientists discovered more objects in space, Pluto became one of the first of a new group of objects called dwarf planets instead.



1,207 km Largest of Pluto's moons

MARS 6,792 km

MERCURY 4,879 km Smallest planet

and closest planet to the Sun

> venus 12,104 km



Nanometres

Nanometres

Extremely small objects are measured in nanometres. There are one billion nanometres in a metre. These objects require high-tech equipment, such as an electron microscope, to 'see' them.

CAESIUM ATOM

0.26 nanometres

Largest naturally ocurring atom • Everything from the air you breathe to your body's cells is made of tiny building blocks called atoms. At the heart of an atom is the nucleus. This is made up of smaller particles called protons and, usually, neutrons. Whizzing around it are even smaller particles called electrons. Different atoms contain different numbers of these particles.

Nucleus

Electron

WATER MOLECULE -

0.27 nanometres Molecules are made up of two or more atoms. Water molecules are made from one oxygen and two hydrogen atoms.

> HYDROGEN ATOM 0.05 nanometres

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Smallest atom

EARTH IS HOT

There are plenty of places on Earth that are hotter than the average surface temperature of 15°C (59°F), including inside your own body! And when you dig deep, things can warm up even more.

NORMAL BODY TEMPERATURE OF HUMANS **36-37.2°C** (97-99°F)

When you get sick, your body fights the attacking germs by raising your temperature a few degrees, giving you a fever.

BODY TEMPERATURE

Most animals are cold-blooded. This means they rely on their environment to keep their bodies at a healthy temperature. But warm-blooded animals, such as birds and mammals, have bodies that control their internal temperatures automatically.

THREE-TOED SLOTH **28°C** (82°F)

This slow-moving animal has one of the lowest body temperatures of any mammal.

CHICKEN 42°C (108°F)

Birds have the highest body temperatures of all animals.



WHAT IS HEAT?

The atoms and molecules that make up all the matter in the universe are constantly moving, vibrating back and forth, even in solid objects. Scientists call this movement thermal energy. When thermal energy is added or removed from matter, this is called heat. So, when you heat up a substance its thermal energy increases and the atoms in it vibrate faster.

Temperature is different. It shows how much thermal energy something has, meaning how fast the atoms in it are vibrating. The faster the atoms vibrate in a substance, the higher the temperature. So how cold does a substance have to get to cause the atoms to stop moving completely? That would be absolute zero (-273.15°C, -459.67° F, or 0 K). So far scientists have never found anything this cold, but they are working on it!





HOTTEST SURFACE TEMPERATURE ON EARTH **56.7°C** (134.1°F)

The 'official' record for highest air temperature on Earth was taken in Death Valley, USA on July 10, 1913.

LIGHTNING BOLT **27,760°C** (50,000°F) The temperature of a lighting bolt is hotter than the surface of the Sun!





wood fire 150°C (300°F)

Most wood can start to burn at this temperature, but can reach over 538°C (1,000°F) if conditions are right.

THE INSIDE STORY

While Earth gets most of its heat from the Sun, it also generates some thermal (heat) energy of its own. Scientists have calculated that for every kilometre you go below the surface, the temperature increases by 25°C (77°F). This steady increase is called the geothermal gradient. Because of it, the temperature deep underground can be much higher than on the surface.

HOT PLANET

Earth's surface temperature might be bearable, but below the surface is superhot rock found in the Earth's mantle layer.

hawaiian lava 1,170°C (2,140°F)

Some rocks below the surface get so hot they melt, forming magma. This liquid rock can erupt from a volcano as lava. Kilauea volcano on the Big Island of Hawaii has been erupting almost continuously since 1983, bringing up a constant stream of magma from below the Earth's surface.

AVERAGE SURFACE TEMPERATURE _____ **15°C** (59°F)

> MANTLE **1,000°C** (1,832°F) **to 3,700°C** (6,692°F).

HEAT IN SPACE

Our Sun is only considered an average star when it comes to temperature, but it's still the hottest object in our solar system. Stars, including the Sun, create light and heat by a process called nuclear fusion. Deep in the centre of our star, hydrogen atoms are squeezed together under such high pressures that they form larger helium atoms. This same process powers a hydrogen bomb, and it releases a huge amount of energy, including heat. QUASAR **10 trillion+°C** (18 trillion+°F)

These super-bright, super-hot objects are found deep in space.

CORE-MANTLE

6,000°C (10,800°F)

BOUNDARY

- SURFACE OF THE SUN 5,538°C (10,000°F)

> CONVECTION ZONE **2 million°C** (3.6 million°F)

RADIATION ZONE 7 million°C (12.6 million°F)

solar core **15,000,000°C** (27,000,000°F)

MPONENG GOLD MINE **66°C (150°F)** This mine in South Africa reaches 4 km underground.

EARTH IS JAGGED

From space, Earth looks like a smooth round ball. But when you get down to the surface, you can see just how rough and jagged our planet is. Here's a look at some of the famous high points and low spots found around our world.

RUPPELL'S GRIFFON VULTURE around 11,250 m Highest flying bird



Earth is loaded with mountains that stick up from the surface. Some, like Mt. Kilimanjaro in Tanzania, sit by themselves while others, like the Matterhorn in Switzerland, are parts of large mountain chains.

Measurements on these pages reflect height above or below sea level.

MT. EVEREST 8.849 m

Mt. Everest is the highest mountain in the world. It is part of the Himalayan mountain range in Asia, which includes all but one of the ten tallest mountains on Earth.

MAUNA KEA 4,205 m

While Mt. Everest is the highest mountain, the Mauna Kea volcano in Hawaii is the tallest mountain when measured from its base to its top even though the summit is only 4,025 m above sea level.

While the base of Mt. Everest is at sea level, the base of Mauna Kea actually sits underwater, about 6,000 m below sea level. With a total height of 10,210 m it is roughly 1,361 m taller than Mt. Everest.

L

5.000 M

10,000 M

7.500 M

MEASURING ELEVATIONS

When scientists measure how high or low a place is, they need to compare it to a reference point on the planet's surface that is not going to change very quickly. This 'zero point' is called a datum. The datum that is most often used to measure elevations on Earth is mean sea level. Mean is another word for 'average', and mean sea level was originally defined as the height of the ocean right between high and low tide. At first scientists used the real height of the sea.

However, because sea level is always changing there is a problem with using it as a datum. To solve the problem, a group of scientists called geodesists collected lots of data and agreed on a figure for a worldwide sea level that never changes. Today GPS systems that measure elevations on Earth use this figure to work correctly.



CHIMBORAZO

Mt. Everest may be the highest place above sea level, but the top of the Chimborazo volcano in Ecuador is furthest from Earth's actual centre. The reason for this difference is because Chimborazo sits at a point on the planet's surface that is bulging out due to Earth's daily rotation.

PASSENGER JET

Cruising altitude

around 10.000 m

2,500 M

OM (SEA LEVEL)

HERBERT NITSCH 253 m below sea level Deepest free dive

> -2,500 M RMS TITANIC **3 800 m** below see level

3,800 m below sea level Shipwreck

STEEP DROPS

Mountains can be very high, and valleys can be very low, but when it comes to seeing just how jagged the surface of the Earth is, there is nothing like the sharp drop of a cliff. Unlike the side of most mountains, which have a slope, cliffs are sheer drops that go straight up and down.

WHITE CLIFFS OF DOVER About 100 m

Located in the UK, these are some of the most famous sea cliffs in the world.

THINGS DOWN LOW

Rivers and glaciers can carve deep canyons and trenches through the Earth's surface. And there are valleys on the ocean floor, too. Some of the valleys are incredibly deep. The deepest valleys, called ocean trenches, can be found at the edge of continental plates in all the major oceans.

GRAND CANYON **1,600 m** average depth below land surface

This 446-km-long gorge in the western USA has been carved into the Earth by the Colorado River.



EL CAPITAN **2,307 m**

One of the most spectacular cliffs in the world, El Capitan features a 1,100 m vertical drop and is located in Yosemite National Park in California, USA. This giant mass of granite rock is a favorite of rock climbers.

— ANGEL FALLS

979 m Some cliffs have water flowing over them, producing spectacular waterfalls. Angel Falls in Venezuela has the highest total drop of any waterfall in the world.

BIG BUILDINGS

Natural landforms aren't the only thing that give our planet a jagged surface. During the last 5,000 years or so, humans have done a good job of creating pretty impressive structures. Some of these can reach incredible heights.



As of 2021, this building in Dubai, UAE, is the tallest building in the world. Records are made to be broken, and construction of even taller structures is already in the works.

GREAT PYRAMID

146 m tall

Even by today's standards, the Great Pyramid in Egypt is a massive structure, and for almost 3,800 years it was the tallest building in the world.



11,034 m below sea level

The lowest point on Earth's surface is called the Challenger Deep. It can be found in one of the low points in the Earth's crust called the Mariana Trench, an ocean trench in the Pacific Ocean near the Philippines.

BENTLEY SUBGLACIAL TRENCH

2,555 m below sea level

This is the lowest point on Earth not covered by an ocean. Reaching this point is impossible, though, because it is under several thousand metres of Antarctic ice.

