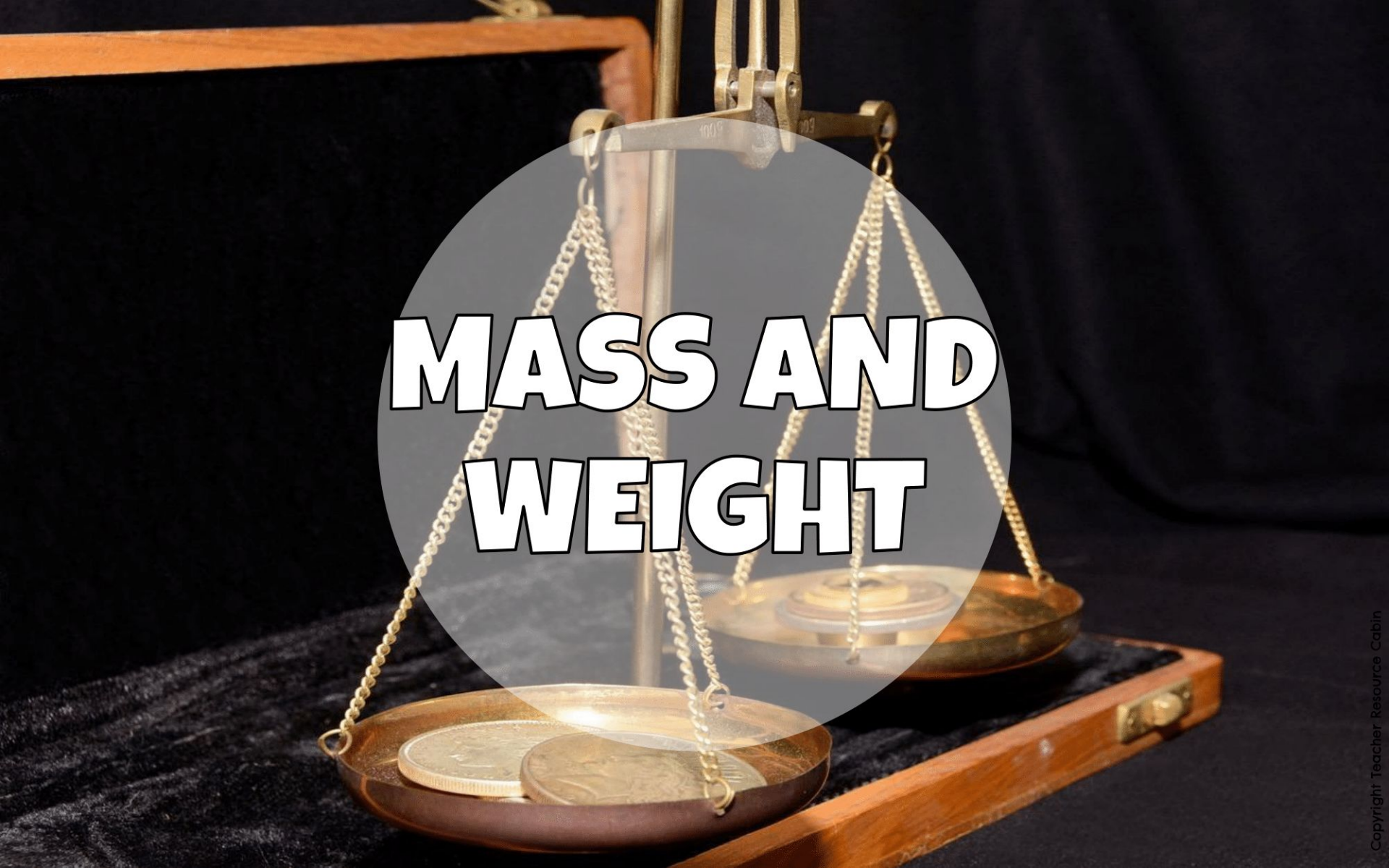

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MASS AND WEIGHT

- Mass and weight are often used interchangeably, but these words have different meanings.
- Mass is a measure of how much matter is in an object.
- Weight is a measure of how the force of gravity acts upon that mass.

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MASS AND WEIGHT

- Anything with mass creates gravity.
- The **gravitational pull** on Earth is created by the **mass of Earth** itself.
  - This pull can vary on different planets in the solar system.
  - When moving a significant distance away from Earth, the strength of this pull starts to decline.

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MASS AND WEIGHT

- Satellites and other space debris are able to stay in orbit on Earth because of their **velocity** and the **gravitational pull** that Earth has on them.

- Satellites positioned closer to Earth experience a greater gravitational pull and require more velocity to resist the gravitational pull.

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? ? ?

Would the gravitational pull be stronger or weaker if you moved further from Earth in space?

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MASS AND WEIGHT

$$W = m \times g$$

Where:

- **W** is the weight of an object
- **m** is the mass of an object
- **g** is the acceleration of gravity

On Earth, the values for mass and weight are usually equal.

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Think about it!

Which values in the weight formula do you think would change if you travelled to space? Why?

$$W = m \times g$$

Where:

- **W** is the weight of an object
- **m** is the mass of an object
- **g** is the acceleration of gravity

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Try it out!

Use the weight formula to solve the problems.

The gravitational pull on Jupiter is 0.38 times that of Earth's. How would this affect your weight on Mercury?

$$W = m \times g$$

Where:

- **W** is the weight of an object.
- **m** is the mass of an object
- **g** is the acceleration of gravity

If something weighs 98 lbs on Earth, what would it weigh on Mercury?

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? ? ?

Why might Mercury have less gravity than Earth?

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Try it out!

Saturn has a gravitational pull of 10.44 m/s^2.

How much stronger is this pull than gravity on Earth?

$$W = m \times g$$

Where:

- **W** is the weight of an object.
- **m** is the mass of an object
- **g** is the acceleration of gravity

If something weighs 85 lbs on Earth, what would it weigh on Saturn?

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QUANTIFYING DISTANCES IN SPACE

DISTANCES IN SPACE

- Astronomers use light years to measure the distance between celestial objects outside the Solar System.
- The distance of one light year is 9.4607×10^{12} km.
- In other words, one light year is approximately 9.46 trillion kilometres.

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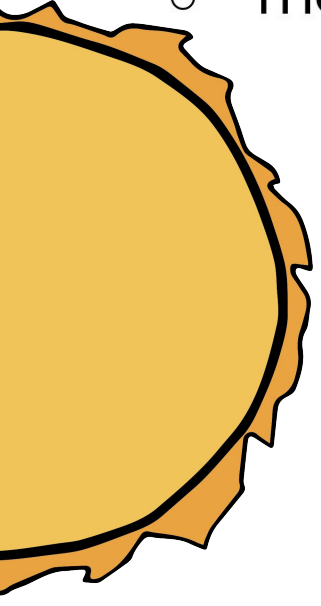
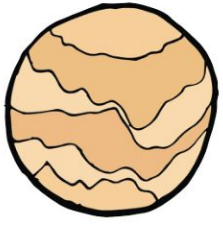
DISTANCES IN SPACE

- **For reference:**
  - The distance from **Earth** to the **Sun** is **149.6 million km**
  - The distance from **Earth** to the **Moon** is **384 400 km**
  - The distance from **Earth** to **Venus** is **41.4 million km**





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DISTANCES IN SPACE

Scientific Notation Reference Chart	
Light Year (ly)	9.4607×10^{12} km
Astronomical Unit (AU)	1.496×10^{8} km

- Astronomers use astronomical units (AU) to measure distances within the Solar System.
- One astronomical unit equates to 1.496×10^{8} km (about 150 million kilometres).

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Try it out!

The distance from Earth to the Sun is one astronomical unit. If the distance from Earth to the moon is 384 400 km, how many times farther is the Sun from the Earth compared to the moon?

Scientific Notation Reference Chart	
Light Year (ly)	9.4607×10^{12} km
Astronomical Unit (AU)	1.496×10^{8} km

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Try it out!

There are 9.4607×10^{12} km in one light year.
What would be the distance of one "light month" and one "light week"?

Scientific Notation Reference Chart	
Light Year (ly)	9.4607×10^{12} km
Astronomical Unit (AU)	1.496×10^{8} km

Light Month

Light Week

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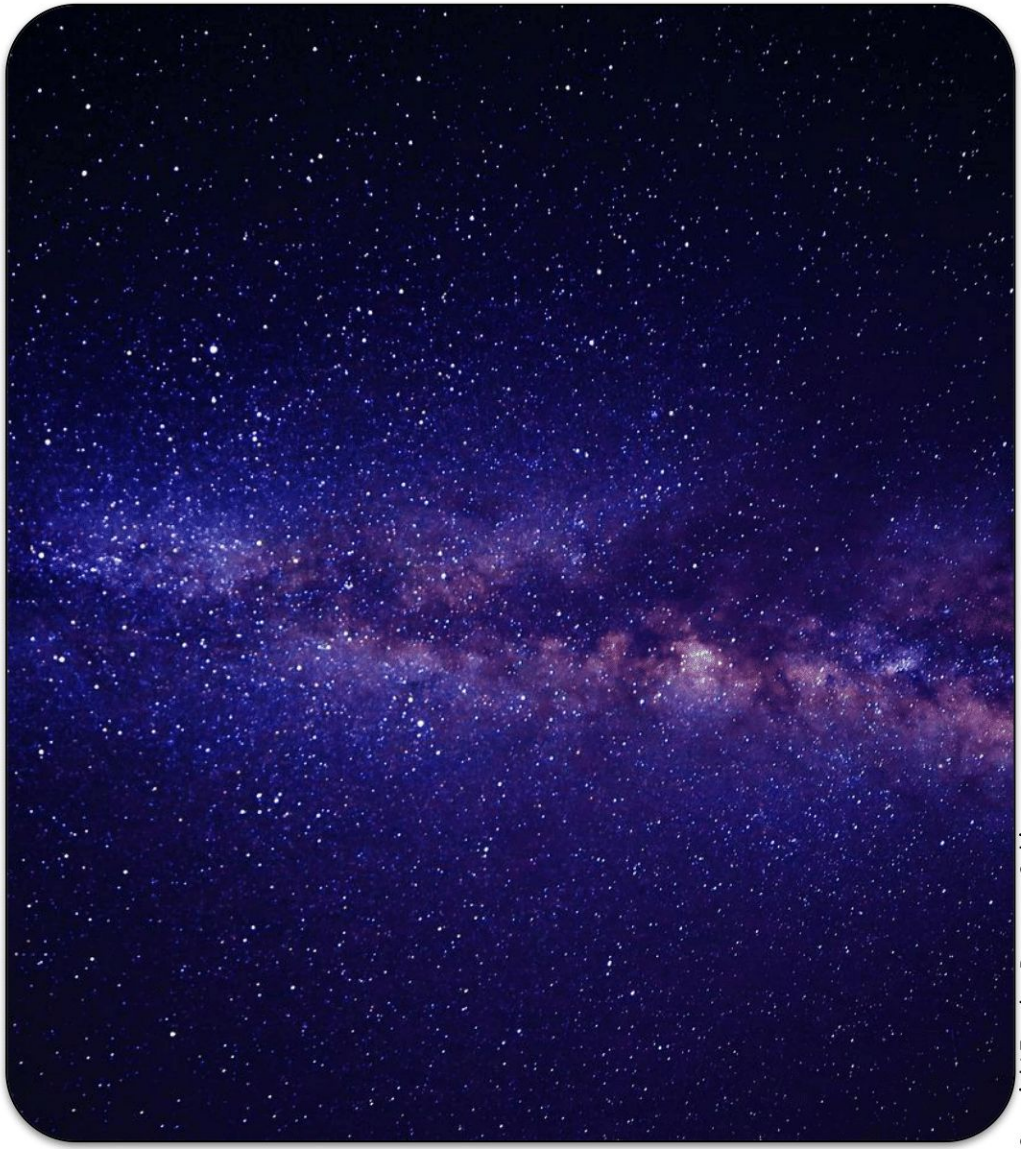
Why do you think different units are used for measurements within and beyond our solar system?



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SATELLITES

- A satellite is something that orbits around a planet or star.
- Satellites can be human-made, or they can be created by nature.

Is the moon a satellite? Explain.

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SATELLITES

- The **moon** is considered a **satellite** because it orbits around the Earth.

- The **Earth** is considered a **satellite** because it orbits around the Sun (as do the seven other planets).

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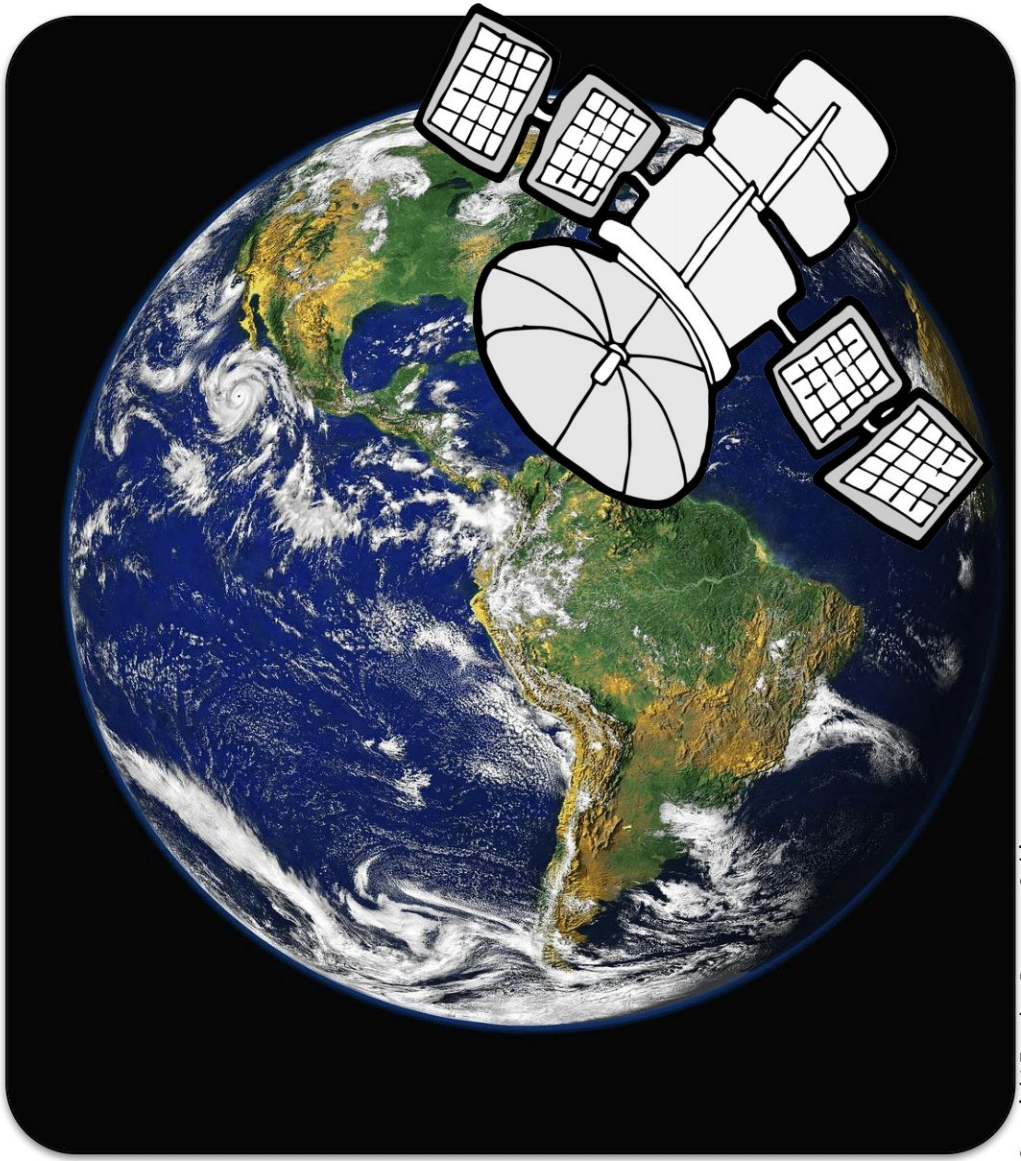
? ? ?

Why do humans create satellites?

What are they used for?



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SATELLITES

- Human-made satellites take pictures of the Earth that are used by meteorologists to predict the weather.
- Satellite images are useful for mapping and GPS systems.
- Satellites are also used for TV signals and phone calls.

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SATELLITES

- The International Space Station (ISS) is a large spacecraft that orbits around Earth.
  - A place in space where **astronauts can live**
  - Orbits the Earth at an average speed of 27,700 km/h
- The first astronauts moved to the space station in the year 2000.
  - It has been inhabited by someone ever since!

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SATELLITES

- Satellites can be made from many parts, but almost all **man-made satellites** consist of an antenna and a power source.
  - The **antenna** allows the satellite to **send and receive information**.
  - The **power source** can be a solar panel or a battery.

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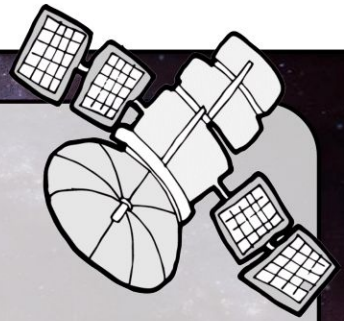
Think about it!

Write a paragraph describing the various benefits that satellites provide to society.



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