Why do planets have different amounts of gravitational force? Notes Key

Mass:

The amount of matter in an object.

measured in **grams** or **kilograms**

Does not change due to location

Volume:

The amount of space that an object take up.

measured in **milliliters** (**ml)** or **cubic centimeters** (**cm^3**)-
also **cubic meters** (**m^3**) for larger values

Does not change due to location

Density:

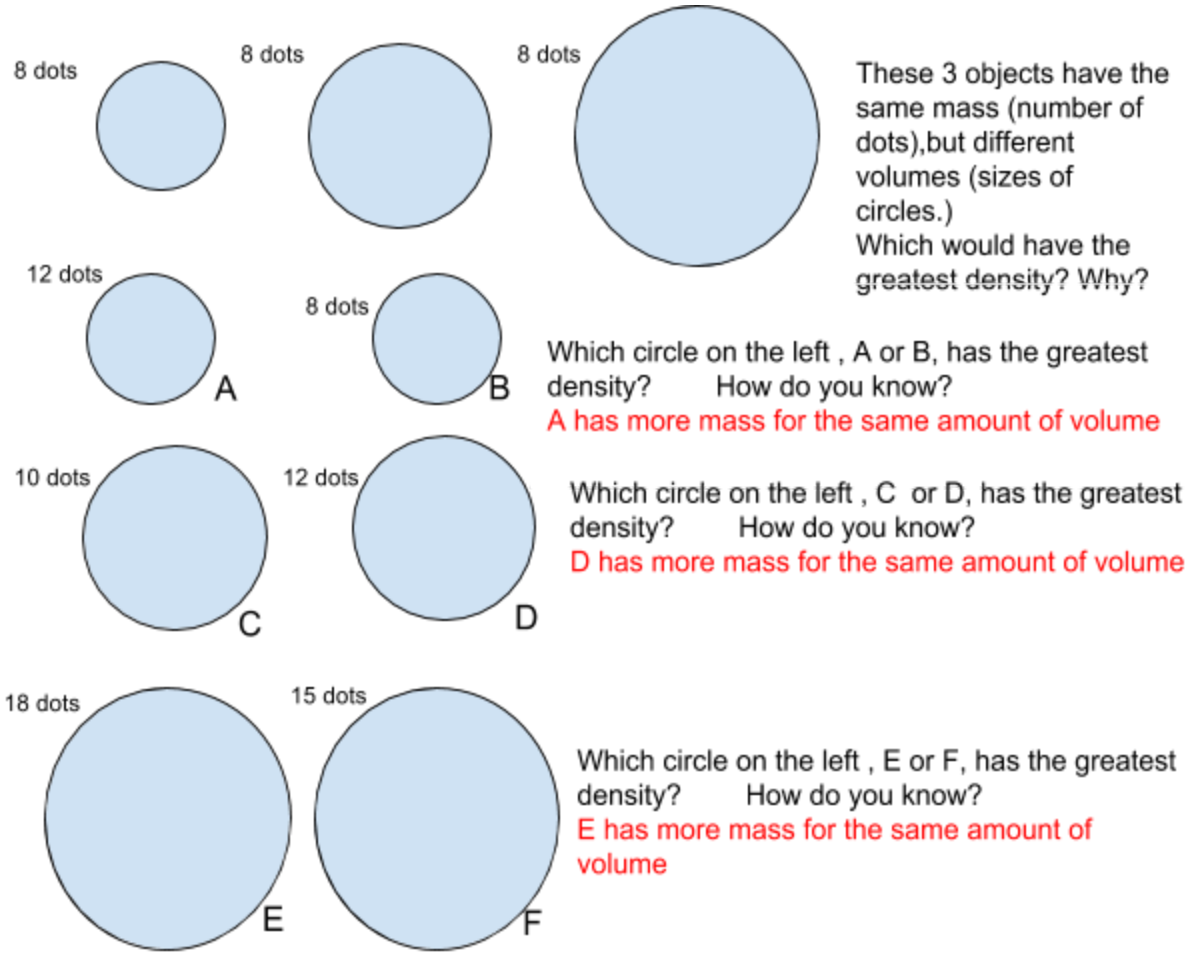
The amount of mass per unit of volume an object has.

measured in **kilograms per cubic meter (kg/m^3)** or **grams per cubic centimeter (g/cm^3)**

Does not change due to location

Use the following circles to represent planets.

- The **amount of dots within a circle** represents its **<u>mass</u>**.
- The **amount of space inside a circle** represents **<u>volume</u>**.
- The **<u>density</u>** is represented by **the the amount of dots per the amount of space inside a circle**.



Do any of the circles above labeled A-F have the same mass? Which ones?

A & D have the same mass, 12 dots

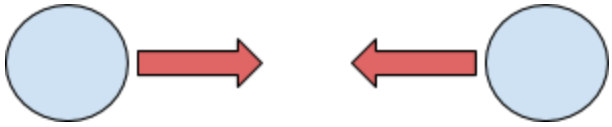
Do any of the circles above labeled A-F have the same density? Which ones?

If you assign the circles a volume of 1, 2 and 3 according to size, D & E would both have a density of 6 dots/unit of volume & C & F would both have a density of 5 dots/unit vol

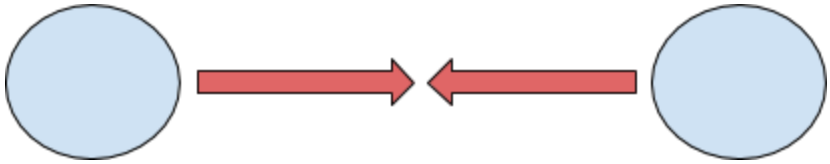
Draw two different size circles below. Have **the circle with the smaller volume have a smaller mass, but a greater density than the larger circle**. Be able to **explain how your picture illustrates this**.

Gravitational Force:

The force that exists between two masses.



The **force of gravity acts between all objects**.



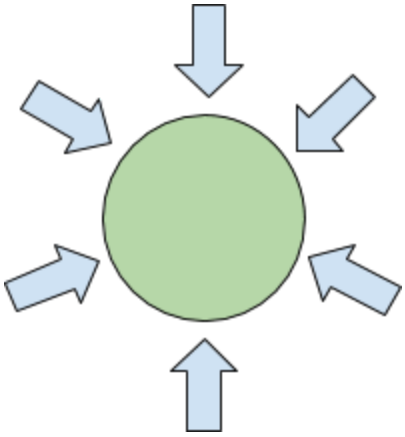
If **mass increases**, the **force of gravity increases**.

If **distance increases**, the **force of gravity decreases**.

The **two factors** that affect **gravitational force** are:

- **mass**
- **distance**

As a result of **gravitational force between the Earth and an object**, when an object is dropped on Earth, it will fall downwards toward the Earth due to the gravitational attraction. ***(Objects are always attracted towards the greatest mass.)***



A **gravitational field** is **a region which a mass experiences gravitational force.**

The **gravitational field strength on Earth is 10 N / kg**.

That **means every 1kg of mass on Earth** will experience **10 N of gravitational force.**

1 kg on Earth ≈ 2.2 pounds

Weight:

The amount of gravitational force acting on a body.

measured in Newtons (and pounds in the United States)

Weight = mass × gravitational field strength
(N) = (kg) × (N / kg)

Changes due to location, depending on the amount of gravitational force.

Relative Gravity:

The amount of gravitational force on different celestial bodies as it compares to that on Earth.

(**Earth's gravity is considered to be 1** on this scale**. Each other celestial body has a percentage of that amount.**)

The decimal 1 = 100% of the weight on Earth
Decimals less than one = less than 100% of its weight on Earth
Decimals greater than one = more than 100% of its weight on Earth

Used to compare weight on Earth to weight on different celestial bodies.

Multiply an object's weight on Earth by the **celestial body's relative gravity factor** to find the **object's weight on the celestial body.**

Example:

Weight on Earth: *150 lb person*

Moon's relative gravity factor .16

(also called **Estimated Surface Gravity**)
(*This means the moon is only 16% as massive as the Earth.*)

Weight on the Moon: 0.16 x 150 = *24 lb person on the moon*