

# What Factors Affect Gravity?



**Gravity** is a force of attraction between things that have mass. The force of gravity causes all of the planets in our solar system to orbit the sun, and it is the reason humans can walk on planet Earth without floating off into space. **Weight** is a measure of the force of gravity on an object. It is different from **mass**, which is how much matter the object contains. Mass is always the same, but weight changes if the force of gravity changes.

**Why do you think the force of gravity changes? Let's find out! Answer the questions below.**

1. Calculate what the weight of a bowling ball would be on some of the rocky planets in our solar system. Multiply the bowling ball's mass by the acceleration due to gravity on each planet, and write the solution in the last column of the table below. The first row has been done for you as an example.

Planet	Mass of Planet ( $10^{24}$ kg)	Bowling Ball Mass (kg)	Acceleration Due to Gravity ( $m/s^2$ )	Bowling Ball Weight (N)
Mars	0.64	7	3.7	25.9
Venus	4.87	7	8.9	62.3
Earth	5.97	7	9.8	68.6

- a. As the masses of the different planets increase, what happens to the bowling ball's weight? **Sample answer**  
As the mass of each planet increases, so does the weight of the bowling ball.
- b. Recall that weight is a measure of the force of gravity on an object. On which of the planets in the table above does the bowling ball experience the greatest force of gravity? Explain your reasoning. **Sample answer**  
The bowling ball experiences the greatest force of gravity on Earth because its weight is greatest on Earth.
- c. What is the relationship between the mass of each planet and the force of gravity? **Sample answer**  
The greater the mass of the planet, the greater the force of gravity.
2. Below is a table showing the force of gravity between Earth and the moon and Earth and Jupiter.

Planetary Object	Mass ( $10^{24}$ kg)	Gravity Between Planetary Object and Earth ( $10^{18}$ N)	Distance From Earth (km)
Moon	0.073	196.8	384,400
Jupiter	1,898	2.2	588,000,000

- a. Circle the name of the planetary object that exerts a greater force of gravity on Earth. **Moon** **Jupiter**
- b. What do you notice about the relationship between the mass of each planetary object and the force of gravity? How is this different from the relationship you observed in the first table? What do you think made this relationship appear to change? (Hint—is there another variable at play?) **Sample answer**  
There is a greater force of gravity between the moon and Earth than Jupiter and Earth, even though the moon has a smaller mass. This is opposite of the relationship I noticed in the first table. I think the distance from Earth made the relationship appear to change.
- c. As the distance from Earth increases, what happens to the force of gravity? **Sample answer**  
As the distance from Earth increases, the force of gravity decreases.
3. Based on your observations from both tables, name **two** factors that affect the force of gravity.  
Mass and distance between objects