

# Gravitation - Lesson 2

## Introduction



**Gravitational force** is one of the four major forces (the other forces are Electromagnetic force, weak nuclear force and strong nuclear force). **It is particularly responsible for the invisible attraction among entities that have a property called mass.**

A brief description of the other three forces:

- **Electromagnetic force** explains the world of electricity and magnetism. Even though, the formula for gravity and electromagnetism is uncannily similar, the force of attraction/repulsion under similar physical conditions is about  $10^{36}$  times stronger than that of gravity.
- **Strong force** is the incredible force that holds the protons inside a nucleus. It is enormous in magnitude, but acts over a very small distance (about  $10^{-15} \text{ m}$ ). Its strength is approximately  $10^{38}$  times stronger than the force of gravity under similar circumstances. *Yeah! It's that "strong".*
- **Weak force** is responsible for radioactive decay. While, the effective range for this force is the least among all (about  $10^{-18} \text{ m}$ ), it is about  $10^{25}$  times stronger than the force of gravity under similar circumstances.

Although, gravity is the weakest force among all, it manages to keep massive planets revolve in an orbit. How? How does this mysterious force enables the formation of orbits? To understand the formation of orbits, we need to understand the independence of horizontal and vertical velocity.

You should, now, be able to answer the following questions:

1. Is gravitational force attractive or repulsive?
2. Define gravitational force?
3. What particular property should an object have so that gravitational force can act upon it?

## Conclusion

Gravitational force is the force that pulls together massive entities. It is also the weakest force among the four fundamental forces.

## Note to Teacher

The text is intended to give students a feel about all the forces present in nature. As gravitational force is the focus here, the text tries to draw comparison between all the other forces to the gravitational force. The lesson also aims to introduce few major questions that will increase the inquisitiveness of the reader.

## Student Worksheet

1. Can gravitational force be repulsive?
2. List all the fundamental forces present in nature?
3. Which is the strongest force in nature?

## Answers

1. Attractive
2. Gravitational force is the force which is particularly responsible for the invisible attraction among entities that have a property called mass.
3. Mass (or Energy)

## Student Worksheet Answers

1. No (Probably)
2. Gravitational force, Electromagnetic force, Weak force and strong force.
3. Strong force