# Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_\_\_\_\_

# **Thinking About Gravity**

**Part 1 -** Go to the following website: <http://phet.colorado.edu/en/simulation/gravity-force-lab> and use the “Gravity Force Simulation” to explore the variables that affect gravity. Record your observations below.

Identify two factors that can change the amount of force (gravity) the objects experience.

Complete the chart for each scenario below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mass 1 | Location 1 | Mass 2 | Location 2 | Force on m1 by m2 | Force on m2 by m1 |
| 25 kg | 0 m | 25 kg | 8 m |  |  |
| 25 kg | 2 m | 25 kg | 5 m |  |  |
| 50 kg | 0 m | 50 kg | 8 m |  |  |
| 50 kg | 0 m | 50 kg | 5 m |  |  |

1. The force of gravity \_\_\_\_\_\_\_\_\_\_\_\_\_ (increases/decreases) as objects move closer together.
2. The force of gravity \_\_\_\_\_\_\_\_\_\_\_\_\_\_ (increases/decreases) as an object’s mass increases.
3. Based on what you’ve seen how would you define gravity?

**.**

**Part 2 -** Watch the following video: <https://www.youtube.com/watch?v=lY3XV_GGV0M> then answer the questions below.

1. The law of gravity states that everything is **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** to **\_\_\_\_\_\_\_\_\_\_\_** else!
2. How does the mass of an object affect its gravitational pull?

1. When two objects of different masses are pulled towards each other, which will move further?
2. How does the distance of two objects from each other affect the gravitational pull?

1. How is does gravity behave *like* magnetism?

**Part 3 -** Go to the following website: <http://phet.colorado.edu/en/simulation/gravity-and-orbits>and use the “Gravity and orbits Simulation” to explore the variables that affect an objects orbit. Record your observations below.

1. Select the Sun and Earth. Draw the path of the Earth orbiting the Sun.
2. Select the Earth and Moon. Draw the path of the Moon orbiting the Earth.
3. Based on your observations, what **similarities** and **differences** can you observe about the motion of the Earth orbiting the Sun and the motion of the Moon orbiting the Earth?

Similarities:

Differences:

1. Select the Sun, Earth and Moon. **Explore** the simulation to determine what keeps the Earth in orbit around the Sun and the Moon in orbit around the Earth.
   1. What do you think the gravity force arrows represent?
   2. What do you notice about the size of the “Gravity Force” arrows?
   3. In what direction do the arrows point? What do you think this means?
   4. Based on your observations, how does gravity affect the Earth’s orbit around the
2. Hypothesize:
   1. If the Sun was less massive, but still the same distance from Earth, what do you think would happen to our Earth’s orbit?
   2. If the Earth were much more massive than it is, but still the same distance from the Sun, what do you think would happen to earth’s orbit?
   3. If the Sun and Earth were their current sizes, but four times as far apart, what do you think would happen to the Earth’s orbit?

It takes 365 days for the Earth to complete one revolution (orbit) around the Sun. Find **three** different ways to change the **number of days** it takes for the Earth to complete one revolution around the Sun.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Method | What did you do? | What happened to the gravitational force arrows? | How many days did it take to complete one revolution? | Observations |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |

1. In a few sentences, what can you conclude about how the **size** of a planet and its **distance** from the Sun affects its orbit?
2. Venus is called Earth’s “sister planet” because it is almost the same size (mass and diameter) as Earth. Venus is closer to the Sun, what can you say about the following? (Circle the word you think is correct)

* The Sun has a **stronger/weaker** gravitational pull on Venus than it does on Earth.
* Venus has a **longer/shorter** period of revolution around the Sun when compared to Earth’s period of revolution around the Sun.

1. Jupiter is has a much larger mass than the Earth and is farther away from the Sun. What can you say about the following?

* Jupiter has a **longer/shorter** period of revolution around the Sun when compared to Earth’s period of revolution around the Sun.

**Part 3 -** Read the following paragraphs and then answer the questions that follow.

**Gravity:** Everything has its own gravity. Everything exerts a pulling force on everything else. However, only large things have enough gravity to successfully pull other objects towards them. *The force of gravity depends on how much mass you have.* The larger the object is, the more gravity it has (The Sun has more gravitational pull than the Earth does). *Distance is also a factor of gravity.* No matter how much gravity an object has, if you aren’t close to it, it won’t pull you in. For example, a black hole is one pinpoint in space with sooooo much mass that its gravitational pull is sooooo strong even light can’t escape its pull! However, regardless of how strong its pull is, if you don’t get near it, you won’t be pulled in. In order for gravity to work, one of the objects needs to have a large mass and the distance between the two objects needs to be small…makes sense right?

**Inertia:** Newton’s law says that any moving object will keep moving in a straight line forever unless something forces it to do otherwise. For example, if we threw a ball out into space, it would keep flying in the same direction forever unless something crashed into it or it got caught in the gravity of a planet or star. Newton called this inertia. According to Newton, the planets are constantly travelling in straight lines away from the Sun. However, while they are travelling away from the Sun, the Sun’s gravity is constantly pulling them back inwards. This causes them to appear to circle or “orbit” the Sun.

1. Gravity is a force of attraction between objects based on their mass and their distance apart. Technically anything with mass has gravity, remember everything attracts everything else! So why aren’t objects, like your pencil, being pulled towards you? Explain your reasoning:

1. Explain why the Earth orbits the Sun (you must use both the terms gravity and inertia in your answer).