

# Out of This World! - Week 7

## Grades 6-8

Day	Topics	Related Standards
1	Gravity and Orbits	Use ratios and proportions to <u>analyze and interpret data</u> related to scale, properties, and relationships among objects in our solar system.
2	Design a Satellite to Orbit the Moon	
3	Build a Satellite to Orbit the Moon	
4	Test a Satellite to Orbit the Moon	
5	Improve a Satellite to Orbit the Moon	

# Out of This World! - Week 7

## Day 1: Gravity and Orbits

### Teacher/Parent Background:

Gravity is a force of attraction between two or more masses. Our Solar System resides in the Milky Way galaxy and is made up of the Sun, eight planets, many moons, asteroids, meteoroids, and comets, which are all affected by gravity. All of the celestial bodies in the Solar System move in predictable patterns known as orbits, and this motion is controlled by gravity. Every celestial body (including Earth) is surrounded by its own gravitational field, which exerts an attractive force on all objects. The Sun's massive gravitational field attracts the entire Solar System to orbit around it.

## Overview:

In this activity, students will use a PhET simulation to move the sun, earth, moon and space station to see how it affects their gravitational forces and orbital paths.

## Related Standards:

Use ratios and proportions to **analyze and interpret data** related to scale, properties, and relationships among objects in our solar system.

## Key Terms:

- Celestial Objects- Objects such as planets, moons, and stars that are located in the sky or in space.
- Solar System- The sun together with the group of planets and other celestial bodies that are held by its gravitational attraction and revolve around it.
- Gravity- The force that causes objects with mass to attract one another.
- Orbital Path- The gravitationally curved path of an object around a point in space.

## Materials List:

- Computer with internet access
- Student Handout

## Activity Description:

1. Provide students with a link to the [Gravity and Orbits PhET simulation](#).
2. Ask students to follow instructions found in the Student Handout.

## Closure:

Discuss the following with students:

1. Why do the changes to the mass of the star affect the orbital path of Earth?
2. Why don't the changes to the mass of the planet not affect the orbital path of the planet?

## Extension:

Watch and Learn!- [Orbits are Odd](#)

## Student Handout

All objects with mass have gravity, even a small ball. The larger the object, the more observable the effects of gravity become.

### Procedure

#### Part I

1. Select the Model simulation.
2. Set the simulation to the Sun and Earth.
3. Check the Gravity Force checkbox.
4. Check the Path checkbox.
5. Set speed to Fast Forward.
6. Press Play.
7. Make observations.

Observations

8. Change the masses of the Sun or Earth.
9. Pause and use the Sun and Earth reset button.
10. Set the Star Mass to Our Sun.
11. Make observations and record your data.
12. Pause and use the Sun and Earth reset button.
13. Set the Star Mass to 1.5.
14. Make observations and record your data.
15. Repeat steps 11–13 for the remaining Star Masses and then Planet Masses.

Star Mass	Planet Mass	Observation	Draw Orbital Path
Our Sun	Earth		
1.5	Earth		
2.0	Earth		
.5	Earth		

Part II

1. Set the simulation to the Sun, Earth, and Moon.
2. Check the Gravity Force checkbox.
3. Check the Path checkbox.
4. Set speed to Fast Forward.
5. Press Play.
6. Make observations.

Observations

7. Change the masses of the Sun or Earth.
8. Pause and use the Sun and Earth reset button.
9. Set the Star Mass to .5.
10. Make observations.

**Observations**

11. Pause and use the Sun and Earth reset button.
12. Set the Star Mass to 1.5.
13. Make observations and record your data.

**Observations**