Gravitation Foldable

You will be using simulators and demonstrations to collect evidence about the factors affecting gravitation on Earth and in Space.

Foldable Requirements

The foldable will be where you collect your data, answer questions and graph information. Please answer all questions in complete sentences. Make sure you are numbering the questions correctly.

You will need to access the activity on StemScopes. Please note, some questions are slightly different. Please use this document for what to fill in your foldable.

Tab 1: Mass and Gravitational Forces

Directions: Go to StemScopes: **Click on Do #1: Mass and Gravitational Forces**.

As a class we will conduct a class demonstration. Fill in the information after we have finished. Answer the questions.

Upper Tab:

Observe the importance of mass on the gravitational force between objects.

	Trial 1	Trial 2	Trial 3
Setup	Large Mass-small mass	Small Mass-Larger Mass	Same mass
Prediction			
Observation			

Lower Tab:

Summary Questions- Answer in complete sentences.

1. In our models, what did the indentation in caused by the balls on the sheets represent?
2. What did you observe in each trial? What does this tell us about how the masses of two objects affect the gravitational force between them?

Notes:

Research Question: **Does gravity pull harder on objects with more mass? Example, what falls faster a 10kg a ball or 5kg ball.**

Tab 2: Do #2: Gravitational Forces Between Objects

Directions: Go to StemScopes and run the PHET Simulation:
https://phet.colorado.edu/sims/html/gravity-force-lab/latest/gravity-force-lab_en.html

Follow the instructions. Copy down the data table and collect the data of gravitational forces.

Upper Tab:

1. Create a data table. Use scientific notation. You will also need to fit a line graph next to it.
2. Complete the table on the top tab.

Mass of m2 (kg)	Gravitational Force at 4m	GF at 6m
5		
10		
15		
20		
25		
30		
35		
40		

Create a line graph with a title and the axes labeled. (You should have 2 lines.)

Lower Tab:

Summary Questions: Answer the following questions on the bottom portion

1. When you ran your simulation:
    1. What variables were fixed?
    2. What variable did you change
    3. What variable changed as a result?
2. Only the mass of m2 was changed in the simulation, but every result showed the same gravitational force for m1 as it did for m2. What do such results tell us?
3. What two factors affect the force of gravity between two objects?

Research Question: What is Newton's Law of Universal Gravitation? What is the formula?

Tab 3: Do #3: Gravitational Forces in Space

Directions: Go to STEMSCOPES. Follow the instructions. Run the four simulations. Please answer the questions below about each simulation.

Gravity and Orbits Simulator:

https://phet.colorado.edu/sims/html/gravity-and-orbits/latest/gravity-and-orbits_en.html

Upper Tab

Simulation 1: Sun and Earth

1. What object orbits the other?
2. What do the blue arrows indicate?
3. Write down your observations:
4. When you change the mass of the Earth?
5. When you change the mass of the Sun?

Simulation 2: Sun Earth and Moon

6. *Which objects orbit around which others?*
7. *Why does the Earth have a circular path; while the moon has a "flower shaped" path?*

Simulation 3: Earth and Moon

8. *Which object orbits around the other?*
9. *Look closely at Earth? What do you observe about its motion?*
10. *Increase the mass of the moon to its maximum. What do you observe about the motion of the Earth now?*

Simulation 4: Earth and Satellite

11. Which object orbits around the other?
12. What happens to the satellites orbit when you change the mass from its minimum and its maximum?
13. What happens to the satellite when you turn off gravity?

Summary Questions: Please answer the following questions in complete sentences.

1. When you look at the four simulations, is there a pattern that determines which object orbits around another? What is it?
2. When the mass of the Sun is changed, why does Earth's orbit change?
3. When the mass of Earth is changed, its orbit stays the same. Why is this?
4. In the simulation of the Earth-Moon system, why do you think Earth is moving slightly instead of staying stationary?
5. Scientists are beginning to develop the technology to observe other suns distant from our Solar System. They can even detect planets orbiting around some of these suns. Some suns appear to have no planets, but

astronomers can see the suns wobble a bit in space. What do you think this means?

Tab 4: Reading STEMSCOPES

Directions: Go to STEMSCOPedia. Read the assigned StemScopes,

In your foldable copy the headings and answer the questions. You will also need to create a table to calculate the weight on different planets.

What is Gravity?

1. What is gravity?
2. Where does gravity pull you to?
3. What two factors determine the strength of gravity?

What do You Think?

1. What is the force causing the tides?
2. Where does this force come from?

Look Out

1. What is the difference between **mass** and **weight**?
2. Complete the Try Now, "Calculate the Weight of a 50 lbs. Dog"

Copy the table into your foldable. Add another column. Predict the mass of each planet, label the planet with the most mass-1, least mass-8.

Research: Any object that has mass has gravity. Any object that has mass is pulled by gravity. Is light affected by gravity?