

# INTRODUCTION TO SNAPS LABS

A SNAPS laboratory includes station activities designed to develop students' science skills with hands-on activities and thought-proving exercises. The labs require students to use science, math, literacy, problem-solving and engineering skills so to expand their understanding scientific ideas and apply scientific concepts to the real world.

## Science Skills Station

Students explore a concept using science and math skills. The skills may be procedural that a student must physically do. The skills may be mathematical or require scientific thinking and reasoning.

## Narrative Station

Students employ literacy skills important to understanding scientific text as well as illustrations, tables and graphs. In many labs, students will explore multimedia sources, such as videos, audio files or animations.

## Assessment Station

Students answer multiple choice questions, short answer questions and/or open-ended, thought-provoking questions. The questions progressively get "harder" and require students to employ lower, mid and higher order thinking.

## Problem-Solving Station

Students utilize the engineering design process and problem-solving skills so to identify problems, test solutions and/or make improvements to solutions.

## Synthesis Station

Students compose a CER report as a lab conclusion so to relate the observations, data and other information gathered in the lab to the objective(s) of the lab.

## Synthesis Project

Students complete an activity or project that helps summarize information studied and learned in the lab. This facilitates "bringing it all together" while getting students to think harder and deeper about a concept.

# SNAPs LAB STATIONS ACTIVITY

The image shows a PDF document titled "MS-PS2-4 Gravitational Force Relationships Stations Lab.pdf" displayed in a web browser. The document is a grid of 21 lab stations, each with a title, instructions, and a diagram or table. The stations are:

- Science Skills Station:** Focuses on identifying variables and relationships in a graph.
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## Features:

- ✓ Connects Science, Math, ELA & Engineering (Problem-Solving) Skills
- ✓ Requires easy-to-get and inexpensive materials
- ✓ **Printable lab** for traditional classrooms included
- ✓ Student Recording Sheets, Teacher Guide and Answer Key included

Printable Lab downloaded as a PDF file. Teacher Guide and Key not shown.



# EDITABLE SNAPs LAB STATIONS ACTIVITY

AutoSave OFF | MS-PS2-4 Gravitational Force Relationships Editable Lab Stations

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**Science Skills Station**

**Objective(s)**

- Discuss the relationship between the mass of an object and the gravity it exerts.
- Make calculations to determine how a planet's mass impacts object's weight.

**Activity #1**

Review a table of the mass and gravitational acceleration for celestial bodies in our solar system. Mass is relative to Earth's mass. For example, "Mars" mass is 0.11 or 11% of Earth's mass.

Directions: Graph mass vs. gravity for planets in the **inner solar system**. Be sure to:

- Create a title and label your axes
- Draw a scale for each axis
- Label each point on your graph with the name of the celestial body.

Celestial Body	Mass (Relative to Earth)	Gravitational Acceleration (m/s <sup>2</sup> )
Mercury	0.06	3.7
Venus	0.82	8.87
Earth	1.00	9.8
Mars	0.31	3.73
Jupiter	318.2	24.79
Saturn	95.15	10.44
Uranus	45.94	8.87
Neptune	17.15	11.31

**Activity #2**

The result of gravity, it is the force on an object due to gravity. In everyday language, people use the terms weight and mass interchangeably. However, it is critical to science to understand that weights **NOT** the same as mass. Mass is a measure of how much matter is in an object. Weight is a measure of how gravity affects mass. Weight is a measure of the force of gravity and how heavy something is. NOT how massive it is.

The equation  $F = mg$  can be used to calculate weight. The variables can be manipulated so that  $Weight = \frac{Force}{Mass} \times \text{gravity}$ . Weight is measured in Newtons (N), mass is measured in kilograms (kg) and gravity is measured in meters per second squared (m/s<sup>2</sup>).

Gravity in this equation is really gravitational acceleration. We often use the terms interchangeably since the force of gravity causes objects to accelerate toward each other. The rate at which objects move towards each other – or the rate at which an object is pulled toward a celestial body – is gravitational acceleration.

In this activity, you will calculate your weight on celestial bodies in our solar system. Follow the directions. Then answer the questions.

1. Convert your mass from pounds to kilograms. Be sure to:

- Make a plan to convert kg to mass in kilograms.

2. Use the equation  $W = mg$  to determine your weight on the following celestial bodies.

Celestial Body	Gravitational Acceleration (m/s <sup>2</sup> )
Earth	9.81
Venus	8.87
Mars	3.73
Jupiter	24.79

Questions:

- What is the relationship between weight and gravity?
- Using the graph created in activity 1, what is the relationship between a celestial body's mass, gravity and weight?
- How do you think your mass would change on different celestial bodies?
- How do you think a change in your weight on planets such as Mars and Jupiter would impact your ability to move around?

**Problem-Solving Station**

**Objective(s)**

Discuss and solve problems that could alter gravitational interactions in our solar system.

**Activity**

Gravity is responsible for orbital paths involving the Sun and the moon. The gravity of the Sun pulls on Earth and keeps it in orbit. Just as the Earth pulls the Sun, the moon orbits the Earth because of Earth's gravity. The Earth orbits the Sun and the moon orbits Earth each way that they move in the same path without crashing or "falling" into each other. The mass of the objects, the distance between the objects and the speed at which they move all play a role in bringing the orbital paths stable.

**Directions**

Write an if-then possible scenario. For each scenario:

- Identify the problem and its impact on the solar system (especially Earth)
- Apply what about gravity to explain the impact on the solar system (especially Earth)
- Evaluate changes that would have to occur to counter the problem and its impact on the solar system. These changes can be realistic or hypothetical.

**SCENARIO #1**

A high asteroid with a diameter of 150 kilometers impacts the moon. The impact is so severe that it causes the moon to move 10,000 kilometers further away from the sun.

**SCENARIO #2**

The mass of the Sun doubles in magnitude. Although the Sun's mass increases, its size does not increase. In essence, the Sun becomes a denser and hotter star.

**SCENARIO #3**

The Earth loses mass. Its size (diameter) does not change, but it is mass is cut in half. In essence, the Earth becomes a less dense planet.

**Synthesis Station**

**Objective(s)**

Students will compose a CER report with evidence and reasoning to summarize how the observations, data and information collected in the laboratory support a claim.

**Background Information**

CER stands for claim, evidence and reasoning. In science, CER is used to write conclusions. For laboratory activities in CER reports, CER explains the relationship between observations, data, interpretations and explanation.

**Claim**

The claim is a statement that answers a testable question. It usually is one sentence statement and often describes the relationship between variables. In this activity, you will be provided with the claim statement.

**Evidence**

Evidence is scientific data used to support the claim. Evidence can be qualitative, quantitative or a combination of both. You can use data from observations, measurements, tables, graphs or research as evidence to support the claim.

**Reasoning**

Reasoning is the logical explanation that connects the claim and the evidence. It explains how and why the evidence supports the claim. The reasoning should include scientific principles or ideas that are important to the claim and evidence.

**Claim**

**Claim: Gravitational interactions with attractive and repulsive forces depend on the masses of interacting objects.**

**Directions**

- On the template, the evidence from the science skills, narrative and/or problem-solving station that supports the claim above. You can bullet point the ideas.
- On the template, the logical explanation and scientific principles that explain how and/or why the evidence supports the claim above. You can bullet point the ideas.
- Write a one paragraph CER report. Write in complete sentences. The CER report is the conclusion to the lab. It should include the claim, evidence and reasoning.

Features:

- ✓ **100% Editable** stations downloaded as a docx file
- ✓ Necessary diagrams, tables and graphs included
- ✓ Illustrative graphics and clipart NOT included

# TEACHER GUIDE

## PRINTABLE LAB SETUP AND PREPARATION

Each “traditional PDF file” includes directions and questions for each station. Print one copy of these materials for each station. Place copies of the letter-sized directions questions in sheet protectors or use self-laminating sheets to protect the documents. Position the materials at each station with the general supplies of that station.

## TEACHING DURATION

Most SNAPs lab activities require **two class periods** or **90 to 120 minutes**. However, the time needed to require one lab can vary with grade level, student autonomy and difficulty of content. Allowing two class periods allows ample time – regardless of these factors – for students to finish the four in-class stations.

Suggestions for shortening the lab:

1. Assign the Narrative Station as pre-lab work. By doing this, you ensure your students have first-order knowledge of the concepts and ideas explored in the lab. If you are using this lab to introduce new concepts, using the narrative station as a pre-lab will increase student success at the other lab stations.
2. Assign the Assessment Station as post-lab work. By doing this, you ensure your students are evaluated on the concepts and ideas in this lab after completing ALL stations.

## DOCUMENT DISTRIBUTION

1. Distribute student copies of the lab overview and pre-lab assignment the night before the laboratory. The pre-lab is a ½ page assignment. Staple the pre-lab to the lab overview before distributing these documents.
2. Distribute student copies of the recording sheet at the beginning of the laboratory.
3. Distribute copies of the post-lab, synthesis station and synthesis project at the end of the lab. The post-lab is a ½ page assignment. Staple the post-lab to the synthesis station and project before distributing these documents.
4. Assign a due date for the synthesis project. The post-lab reflection is a formative assessment and should not require a formal “due date.”

# TEACHER GUIDE

## DIGITAL VERSION OF SNAPs LAB ACTIVITIES

This download includes a digital lab/fillable slides that allow students to complete the laboratory on a computer or tablet. This file was created to work with a variety of online platforms and secure file-sharing platforms. The digital lab has been modified so students record answers directly following questions rather than in a student packet.

### Important Notes

- The answer key is removed from the digital lab.
- The answer key is included in the traditional PDF file.
- The digital laboratory CANNOT be edited; only fillable areas can be manipulated.
- When applicable, videos are included to help students create digital graphs.

The digital laboratory can be used a variety of ways:

- Distribute paper-free laboratories as part of regular instruction
- Use to assign at-home work as part of a remote or distance learning plan
- Send work to acutely or chronically absent students
- Support tutoring or at-home instruction for homebound students

How can you distribute and share the digital laboratory with your students?

- The laboratory CAN be distributed directly to students through email.
- The laboratory CAN be distributed or assigned with Google Classrooms, Microsoft Teams, Blackboard, Canvas, Schoology and other like platforms that are password-protected or require a code to enroll.
- The laboratory CAN be distributed with secure file sharing platforms like Google Drive, OneDrive and DropBox that are password-protected or shared only with students with their email or student account.
- Printable SNAPs labs can be shared or distributed just like the digital labs.

# TEACHER GUIDE

To use the digital laboratory with Microsoft Teams:

1. Upload an assignment to your One Drive.
2. Create a new assignment. Add the file as a "resource."
3. Assign to the appropriate class or students.

To use the digital laboratory with Google Classrooms:

1. Upload the assignment to your Google Drive. Add the file using the upload tool in a web browser or drag and drop the file into your Drive. Watch a demonstration of the process: <https://safesha.re/3h6n>
2. Create a new assignment and add the digital lab to it. Make a copy for each student.
3. Assign to the appropriate class or students.

## GOOGLE FORM ASSESSMENT

To better support digital classrooms, I created a Google Form version of the assessment station. There are two ways the Google Form assessment station can be used:

1. If using the digital lab, you can remove slides for the assessment station and use the Google Form assessment station instead. This makes the assessment station "more formal" since it is separate from the rest of the lab station activities.
2. If looking for a way to shorten the in-class lab, remove the assessment station – including the assessment station student recording pages – and assign the Google Form assessment station as an at-home assessment. Alternatively, you can use the Google Form assessment station as an in-class quiz if students have their own digital personal learning device.

# TEACHER GUIDE

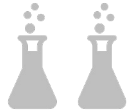
## DISTANCE – INDEPENDENT LEARNING COMPATIBILITY

SNAPs lab activities are rated for their ease with distance – independent learning. Some lab activities are very hands-on and require a lot of materials whereas other lab activities are more thought-provoking and require minimal – or no – additional materials.

This lab has been rated the following:



The lab requires no modification to the required materials for distance – independent learning. All materials important to the lab are included in the digital lab. A calculator, colored pencils or a ruler may be needed.



The lab requires some modification to the required materials for distance – independent learning. Students can use household items, if needed, to complete hands-on activities.



The lab requires significant modification. Teacher should demonstrate or perform activities in a live session or prerecorded video and/or provide materials needed for the science skills or problem-solving station.

## Suggestions

- No suggestions made for this lab.
- Students will have everything needed to complete this lab independently.



# TEACHER GUIDE

## EDITABLE COMPONENTS OF SNAPs LAB ACTIVITIES

This download includes an editable word document of all lab components. The stations are available as fully editable DOCX files., Diagrams, illustrations, tables and/or graphs that are essential to lab activities are included in the editable document. Illustrative clipart is NOT included in the editable document.

Some labs have a directed synthesis project. When applicable, the directed synthesis project is available as an editable word document as well. Editable documents and rubrics important to standard synthesis projects are included in the [SNAPs Lab Stations Setup Guide](#).

There are three important reasons for creating editable versions of these stations:

1. Most lab station activities utilize five or more stations with relatively simple and short activities. However, my SNAPs lab activities include four comprehensive stations. The science skills station and problem-solving station could be used independently as single class period laboratories. To better allow for this option, I have made these stations editable. Teachers can use the narrative station as "pre-lab" work and the assessment station as "post-lab" work.
2. The science skills and problem-solving stations are the only stations that will require materials other than computers or calculators. By providing these stations in an editable format, you can manipulate the materials required and/or the directions so the activities work for your classroom.
3. By making the science and problem-solving station editable, you can alter the scope of the activities to suit your students' needs. You can also edit the questions so to evaluate your students in a manner that is best for you and your classroom.

**MAKE SURE YOU DOWNLOAD the FREE [SNAPs Lab Stations Setup Guide](#) for SIGNAGE, BEST PRACTICES & EDITABLE DOCUMENTS (<https://www.teacherspayteachers.com/Product/SNAPs-Lab-Stations-Guide-2953726>)**