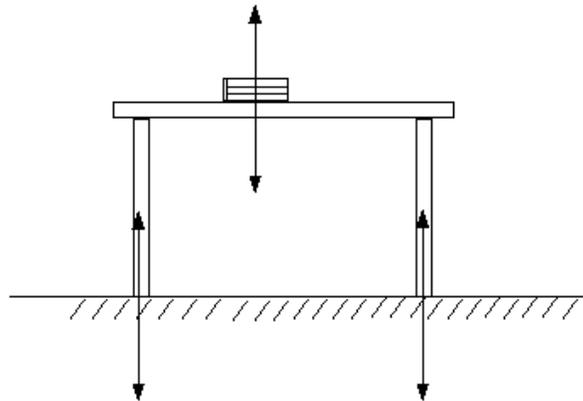




# NASA Spotlite Interactive Lesson

## Objects at Rest Grades 5-8



## Student Packet



# NASA Spotlite Interactive Lesson Guide

## What are NASA Spotlites?



NASA Spotlites are 90-120 second student-produced video segments that address common science misconceptions.

NASA Spotlites are designed to increase scientific literacy in a standards-based classroom. By producing Spotlite videos, students gain production experience, as well as deepen their understanding of science content. Approved NASA Spotlites can be found at the NASA eClips website.  
<https://nasaclips.arc.nasa.gov>



A misconception is a view or opinion that is incorrect because it is based on faulty thinking or understanding.

This is an Interactive PDF. Features in this packet may include:

- fillable boxes
- quick checks
- multiple choice questions
- interactive GIFs (graphics interchange format)
- links to videos and online interactives

The hyperlinks included in this document open PDFs or webpages and may perform differently based on the device being used. Links may have to be cut and pasted into a web browser to open. PDFs and other documents may need to be downloaded to view.

*Try using Adobe Acrobat Reader and Flash Player for optimal performance of all interactive features included in this guide.*



Remember to save your responses.  
Under "file" choose "save as."  
Type your name in front of the document name.  
Choose "save."

# Pretest

## Objects at Rest Grades 5-8 Pretest NASA Spotlite Interactive Lesson

Read each question and select the best choice.

1. Identify the statement that correctly describes forces acting on an object at rest.

4. No change in force is necessary to:

2. An apple is resting on a desk. The apple:

5. Sharon went bowling with her friends. The pins standing at rest at the end of the lane:

3. Which statement about forces is TRUE?



# Engage

## Pre-assessment

In today's lesson you will learn about forces. Using interactive Frayer Models, you will learn key vocabulary that will help you form a clearer understanding of how forces act on objects at rest.

What do you already know about the forces acting on objects at rest?

## Spotlite Video

Next, you will watch a short video on objects at rest. As you watch the video, pay close attention to any new vocabulary.



### Video Link- NASA Spotlite: Objects at Rest

NASA eClips™ Website -<https://nasaclips.arc.nasa.gov/spotlite>

NASA eClips™ YouTube -<https://youtu.be/1hCcbESXpGs>

**True or False:** An object at rest has no force acting on it.

# Explore

## Explore Activity

In this experiment you will learn about inertia. In the investigation, you will try to remove a book cover from under an object without moving the object on top. Magicians do this all the time. Have you ever seen a magician pull a tablecloth out from under a pile of dishes? Was it magic or science?

You will need the following items for this experiment:

- one book cover or large piece of smooth paper
- one book with a hard, glossy cover
- one book with a rough or non-glossy cover
- other objects to place on the book cover

Procedures:

1. Place the book cover (or piece of paper) on a flat, smooth surface.
2. Put the book with the glossy cover on top of the book cover.
3. Quickly (and in one smooth motion) yank the book cover out from under the book.
4. Write down what happens.
5. Do the experiment again, this time putting other objects on top of the book cover. Observe what happens and write your answers to the following questions:
  - Does mass have any effect on the experiment?
  - Does the type of object you add have any effect? If so, in what way and why?

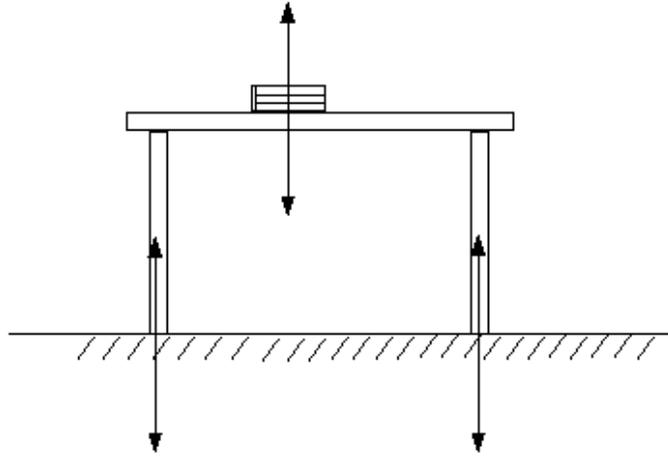
6. Try the experiment again using a book with a rough or non-glossy cover. What do you notice? Can you explain how this experiment relates to Newton's First Law of Motion?

Activity Source - Swift Mission Education and Public Outreach  
[http://swift.sonoma.edu/education/newton/newton\\_1/html/newton1.html](http://swift.sonoma.edu/education/newton/newton_1/html/newton1.html)

# Explore

## Explore Activity

In this picture identify two forces acting on each object that is at rest.



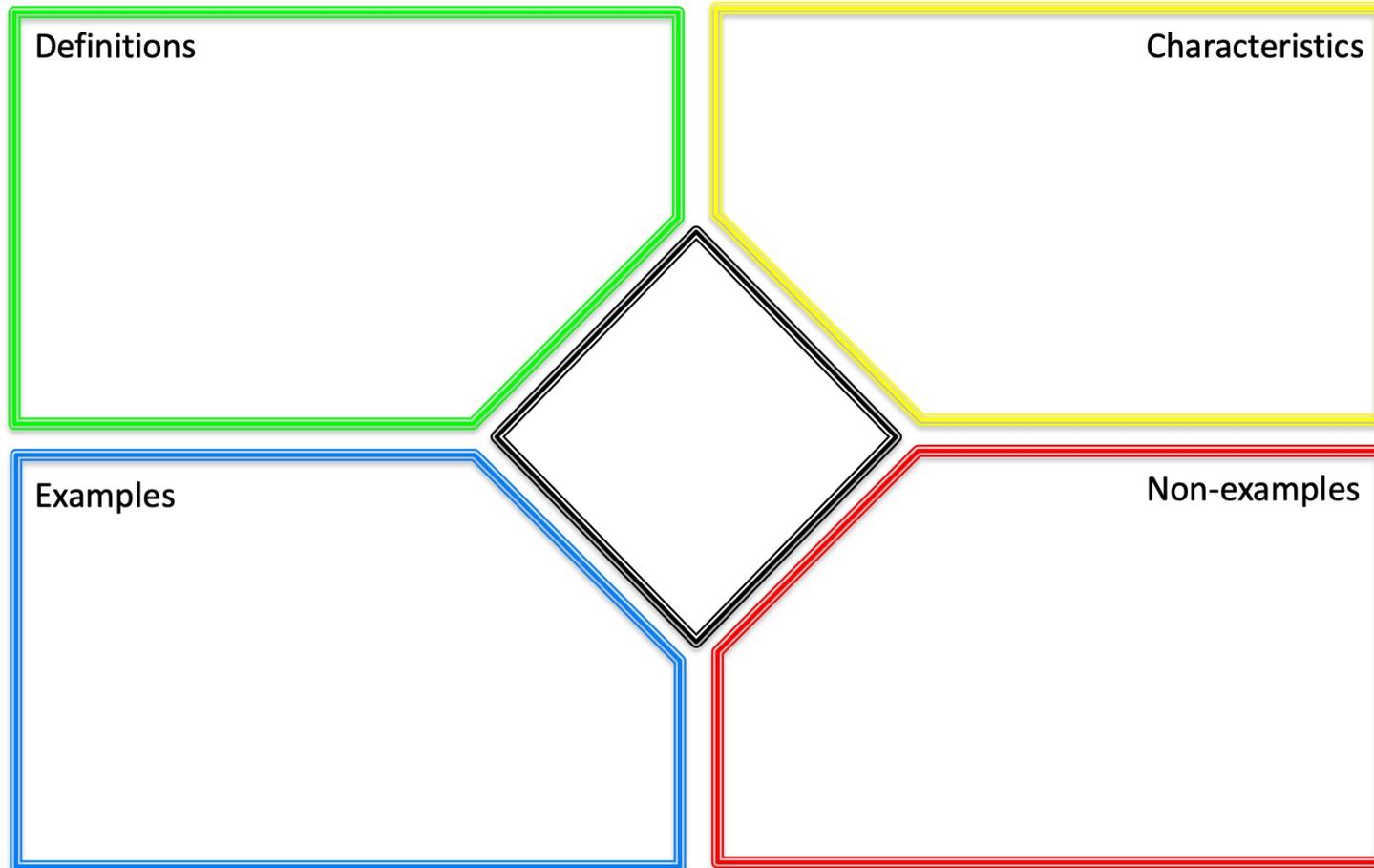
## Think-Pair-Share

What forces act on objects at rest?

# Resources

## Frayer Model for Vocabulary Development

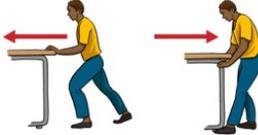
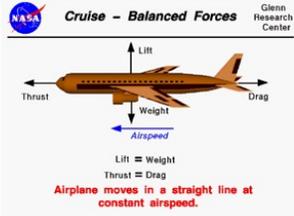
Use the graphic organizer to write definitions, characteristics, examples and non-examples for a vocabulary word. You can include drawings, graphics, and diagrams.



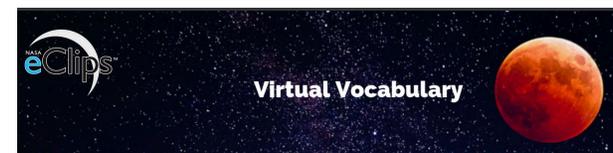
The graphic organizer is a Frayer Model, which is a diamond-shaped diagram with four quadrants. The top-left quadrant is labeled "Definitions" and has a green border. The top-right quadrant is labeled "Characteristics" and has a yellow border. The bottom-left quadrant is labeled "Examples" and has a blue border. The bottom-right quadrant is labeled "Non-examples" and has a red border. The center of the diamond is a white diamond shape with a black border, representing the vocabulary word being studied.

# Explain

## Vocabulary Words

Word	Definition	Word	Definition
<b>INERTIA</b> 	Inertia is the tendency of an object to continue doing what it is doing, either moving or resting, unless acted on by an outside force. The inertia of an object is related to its mass (the greater the mass, the greater the inertia).	<b>FORCE</b> 	A force is whatever can cause an object with mass to accelerate (change its direction or speed). Force may be expressed with both magnitude (speed or velocity) and direction.
<b>DIRECTION</b> 	Direction is the line or course on which something is moving.	<b>GRAVITY</b> 	Gravity is a force between objects based on their masses and the distance between the objects.
<b>SPEED</b> 	Speed equals distance divided by time or $s = d / t$ .	<b>BALANCED</b> 	Balanced means having different parts or elements properly or effectively arranged, proportioned.

Visit the NASA eClips™ Virtual Vocabulary for more definitions.



# Elaborate/Extend

## Elaborate/Extend Activity

List 3 examples of objects from this room that are at rest and identify the forces acting on them.



[https://img.etsystatic.com/il/7b8951/993607886/il\\_340x270.993607886\\_6oxg.jpg?version=0](https://img.etsystatic.com/il/7b8951/993607886/il_340x270.993607886_6oxg.jpg?version=0)

Select one object from the list and describe what would happen to that object if the forces acting upon it were unbalanced or not equal.

## NASA Connection

The Antares launch vehicle stands 40.5 meters tall, has a main diameter of 3.9 meters and a liftoff mass of approximately 282,000 Kilograms. It needed two powerful engines to launch it into space.



This Antares rocket stands ready for liftoff at NASA Wallops' Island.

What forces are needed to keep the Antares rocket at rest?

Learn more about Antares at this link.

<https://science.nasa.gov/>

# Evaluate

## Post-Assessment

### Identify Misconception

What is a common misconception about objects at rest and how can you correct this misconception?

Carefully rewatch the NASA Spotlight video about forces on objects at rest to assess your understanding of Newton's First Law.



### Video Link- NASA Spotlight: Objects at Rest

NASA eClips™ Website -<https://nasaclips.arc.nasa.gov/spotlite>  
NASA eClips™ YouTube -<https://youtu.be/1hCcbESXpGs>

## Vocabulary Review

Now complete this fill-in-the-blanks activity using vocabulary about objects at rest.

There are many forces that act on an object at rest. A force is what causes an object with mass to (1), change direction or speed. The force between objects that is based on their masses and the distance between the objects is called (2). (3) is the tendency of an object to continue doing what it is doing, either moving or resting, unless acted on by an outside force. When an object is at rest or at a constant speed, we say the forces acting on the object are (4).

### Word Bank

gravity  
inertia  
accelerate  
balanced

- 1.
- 2.
- 3.
- 4.

Using your new vocabulary words, explain how forces act on objects at rest.

# Posttest

## Objects at Rest Grades 5-8 Posttest NASA Spotlite Interactive Lesson

Read each question and select the best choice.

1. Identify the statement that correctly describes forces acting on an object at rest.

4. No change in force is necessary to:

2. An apple is resting on a desk. The apple:

5. Sharon went bowling with her friends. The pins standing at rest at the end of the lane:

3. Which statement about forces is TRUE?



# Product Information

Image Credits:

## **Cover, pages 3 and 6**

forces on table- [https://www.grc.nasa.gov/www/k-12/WindTunnel/Activities/third\\_law\\_motion.html](https://www.grc.nasa.gov/www/k-12/WindTunnel/Activities/third_law_motion.html)

## **Extend/Elaborate**

table set - <https://www.etsy.com/listing/240803854/farmhouse-breakfast-table-or-dining>

## **Vocabulary Words**

inertia - [https://cdn.pixabay.com/photo/2017/09/27/12/48/shipping-2791948\\_960\\_720.png](https://cdn.pixabay.com/photo/2017/09/27/12/48/shipping-2791948_960_720.png)

direction - [https://cdn.pixabay.com/photo/2016/07/23/05/53/choose-the-right-direction-1536336\\_960\\_720.jpg](https://cdn.pixabay.com/photo/2016/07/23/05/53/choose-the-right-direction-1536336_960_720.jpg)

speed - [https://cdn.pixabay.com/photo/2016/03/11/02/08/speed-1249610\\_960\\_720.jpg](https://cdn.pixabay.com/photo/2016/03/11/02/08/speed-1249610_960_720.jpg)

force - [https://c1.staticflickr.com/6/5529/13580916224\\_b3028f5fc9\\_b.jpg](https://c1.staticflickr.com/6/5529/13580916224_b3028f5fc9_b.jpg)

gravity - <https://www.maxpixel.net/Parachute-Skydiving-Free-Falling-Team-Free-Fall-603646>

balanced - <https://www.grc.nasa.gov/WWW/k-12/VirtualAero/BottleRocket/airplane/Images/cruise.gif>

## **Evaluate**

bowling - <https://media.defense.gov/2013/Mar/25/2000064826/1088/820/0/130322-F-JH648-077.JPG>

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