

CH. I FORCE AND VELOCITY

2

1.2: Describing Changes in Motion

19 Lessons

Force and Motion





F&M: 1.2.1 WARM-UP

Students describe how the motion of an object can change. (5 min)

Work independently to answer the following questions. TURN IN!!!

1. How can the motion of an object that is already moving change?

An object that is already moving can ...

Stop moving, speed up, slow down, or change direction.

2. How can the motion of an object that is NOT moving change?

An object that is not already moving can ...

start moving.



F&M: 1.2.1 WARM-UP

Unit Question: How do forces affect motion?

This will be the central question guiding your investigations throughout the unit.

Chapter 1 Question: *What caused the pod to change direction?*

You will be investigating a mystery

VIDEO - A space pod was sent on a mission and in the few seconds that it lost contact with the ground, it moved in an unexpected way.

Talk with a partner about the reflection question after the video.



This investigation will help you understand how forces affect the motion of objects.

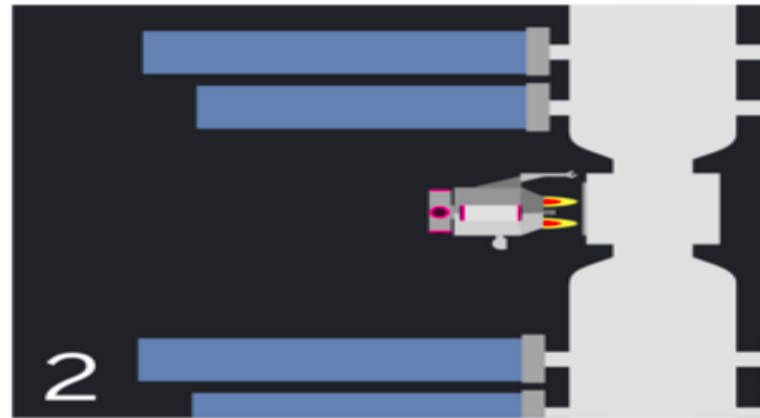


F&M: 1.2.2 WHAT HAPPENED TO THE POD?

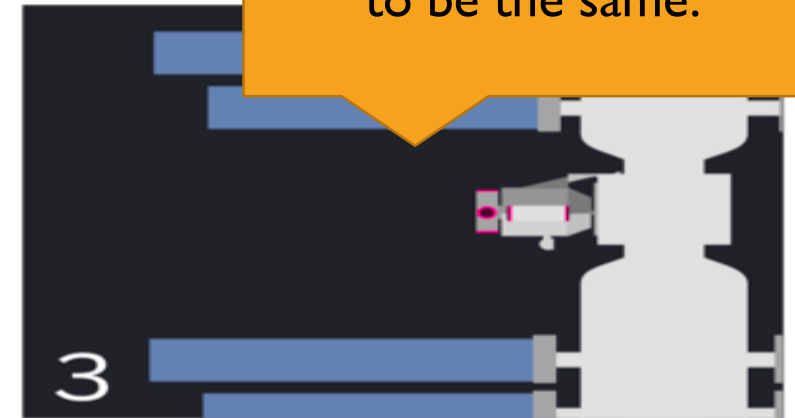
Asteroid Collection Missions



Pod approaches space station at high speed.



Thrusters fire to stop the pod.



Docking: pod connects to space station.

the most recent mission had the same objective as other missions— everything was supposed to be the same.

The thrusters, or small engines, were supposed to fire and stop the pod just as it reached the space station so it could dock and deliver the samples. Instead, this pod moved in the opposite direction.



F&M: 1.2.2 WHAT HAPPENED TO THE POD?

Normally, when the thrusters fire, the pod will stop, but this mission was different.

Claim 1: The thrusters caused the pod to move in the opposite direction.

Claim 2: The thrusters only slowed the pod, it didn't stop; the pod hit the space station, which made it bounce and move in the opposite direction.



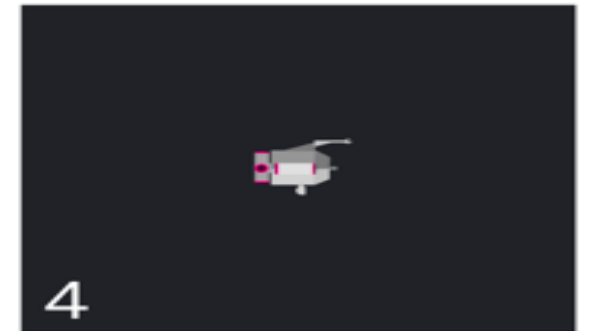
Pod approaches space station at high-speed.



Thrusters fire to stop the pod.



Thrusters cause pod to move in opposite direction OR pod hits space station and bounces off.

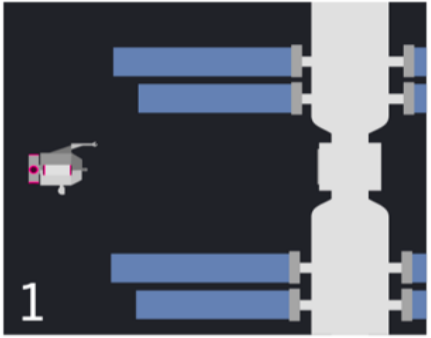


Pod travels far away from the space station.

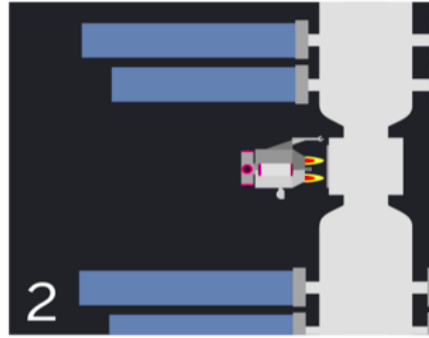


F&M: 1.2.2 WHAT HAPPENED TO THE POD?

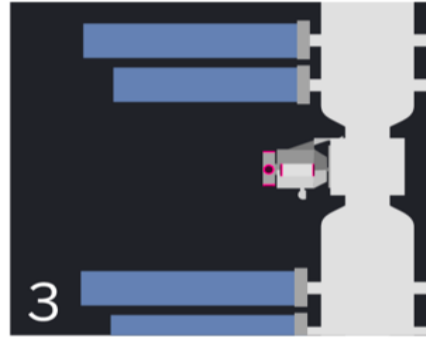
Asteroid Collection Missions



Pod approaches space station at high speed.



Thrusters fire to stop the pod.



Docking: pod connects to space station.

Claim 1: The thrusters caused the pod to move in the opposite direction.

Claim 2: The thrusters only slowed the pod, it didn't stop; the pod hit the space station, which made it bounce and move in the opposite direction.

When the space agency regained contact, why did they find this pod moving in the opposite direction?

DISCUSS

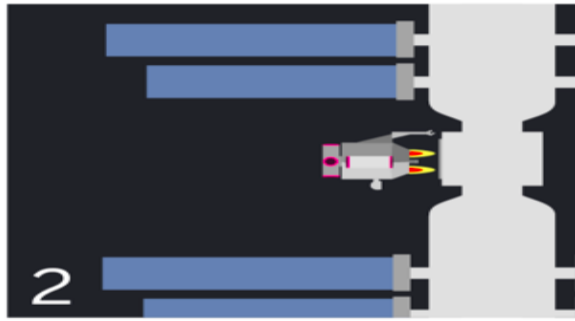
USA knows something was different—the thrusters did not have the effect they usually do—this pod did not stop at the space station and dock. These claims are different explanations for what happened. How are they different?



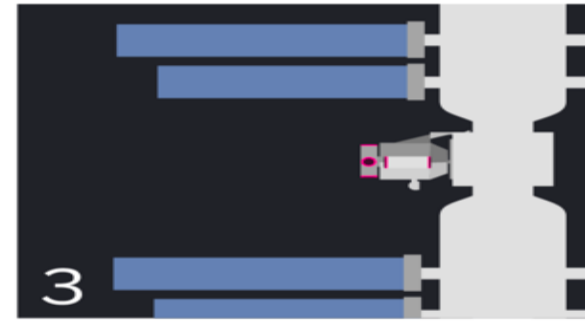
Asteroid Collection Missions



1 Pod approaches space station at high speed.



2 Thrusters fire to stop the pod.



3 Docking: pod connects to space station.

In Claim 1, the thrusters cause the pod to move in the opposite direction;

In Claim 2, the thrusters slow the pod down, but it's not enough, so it collides with the space station.



F&M: 1.2.2 WHAT HAPPENED TO THE POD?

Compare the claims storyboard with the storyboard showing the expected outcome.

Normally, when the thrusters fire, the pod will stop, but this mission was different.

Claim 1: The thrusters caused the pod to move in the opposite direction.

Claim 2: The thrusters only slowed the pod, it didn't stop; the pod hit the space station, which made it bounce and move in the opposite direction.

LETS VOTE!!!



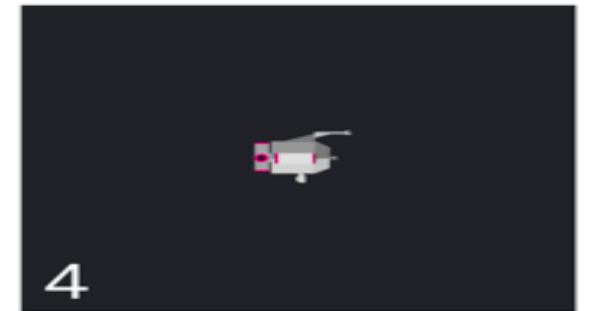
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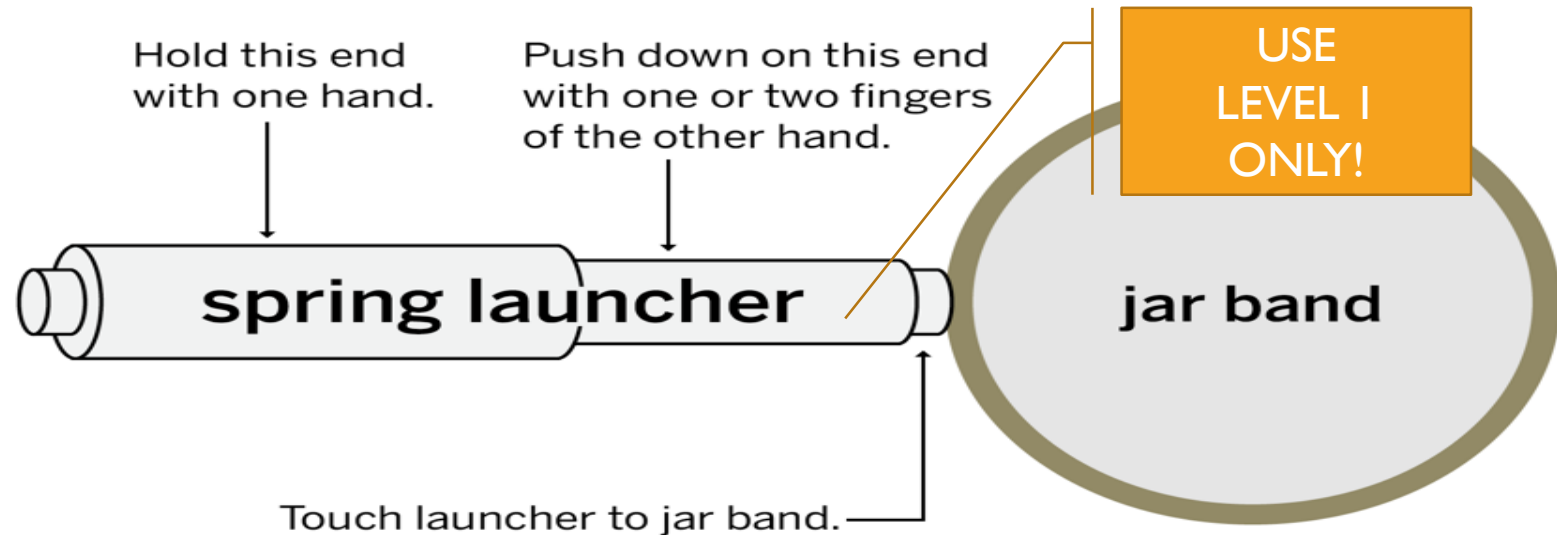
Chapter 1 Question: *What caused the pod to change direction?*

Activity - Exploring how the motion of an object can change and what causes these changes to happen.

How can the motion of an object sitting on a table change? How can the motion of an object sliding across a table change?

First step in determining what happened to the pod is to come up with some possible reasons that it would change direction. — **testing objects to see what makes them experience a change in motion can help answer our question.**

Top View of Launcher Setup





Exploring Changes in Motion

Use the materials on your tray to investigate the guiding question. Record your notes in the table below. One possible answer has been provided to help you get started.

Note: You are not required to use the spring launcher for every trial, but when you do, be sure it's only at level **1**.

Guiding Question: *In what ways can the motion of an object change?*

- An object that is already moving can ...
- An object that is not already moving can ...

Spring launcher is only to be used at the **1st** setting!!!

**Conduct tests to discover answers to the guiding question.
You do not have to use the spring launcher the entire time.
Use all the objects and move them in different ways.**



8 MINUTES
TO TEST



EH – 1.2.3: EXPLORING CHANGES IN MOTION

After conducting tests, complete guiding question.

Guiding Question: *In what ways can the motion of an object change?*

In what ways can the motion of an object change?

Example: An object that is already moving can slow down.

DISCUSS WITH
OTHER GROUPS!

TURN IN!!!



EH - 1.2.4 DISCUSSING CHANGES IN MOTION

Students summarize what they have learned about changes in motion. (10 min)

What are the FIVE ways an object's motion can change?

Use what you learned in today's activity and discuss this with a partner. Put your ideas in a list. One response has been filled in to help you get started.

1. start moving **START MOVING**

2.

3.

4.

5.

***All these changes in motion
involve a
change in speed or direction.***

What is the word for this??????



VELOCITY

speed in a particular direction

A change in motion is the same thing as a change in velocity.



EH - 1.2.4 DISCUSSING CHANGES IN MOTION

When physicists talk about motion, they have to agree on how to describe it.

Direction is important when describing an object's motion but you also need to agree on what is called the "frame of reference."

For example, if I hold this pencil at arms length in front of me as I walk across the room, from my frame of reference, the pencil is not moving. But from your frame of reference the pencil is moving.

When you described the motion of the objects in the last activity, you used your frame of reference.

We will continue to use your frame of reference throughout the unit.





EH - 1.2.4 DISCUSSING CHANGES IN MOTION

$$1) \text{ Velocity} = \frac{\text{Distance}}{\text{Time}}$$

$$2) \text{ Time} = \frac{\text{Distance}}{\text{Velocity}}$$

$$3) \text{ Distance} = \text{Velocity} \cdot \text{Time}$$

Physicists also agree on the units they are using. The units for velocity help describe how fast the object is moving.

Throughout the unit, we will use centimeters as our measure for distance, and centimeters per second as the units for velocity, but other units for velocity can be used as long as you make sure you describe the units.

Can you think of other examples of units that could describe velocity.

meters per second, kilometers per hour, miles per hour.



1. **START MOVING**
2. **STOP MOVING**
3. **SPEED UP**
4. **SLOW DOWN**
5. **CHANGE DIRECTION**

You will continue to explore how objects can change velocity over the next few lessons. Next lesson will focus on **FORCE**

Remember that a change in motion is the same thing as a change in velocity.



Homework: Creating a Model to Explain What Happened to the Pod

Name: _____ Date: _____

Homework: Creating a Model to Explain What Happened to the Pod

Today you watched a video about a space pod that was trying to dock, but something happened to cause the pod to move away from the space station instead. Scientists don't know what caused this change in direction, because a few seconds of the video went out just as the pod was about to dock. **Create a model to explain what you think happened during the missing seconds that caused the pod to move away from the space station, in the opposite direction.** To create your model you may want to do one of the following:

- Use objects you have at home to show what you think happened. If you do this, bring these objects into class and be prepared to explain what you think happened.
- Create a diagram-model to show what you think happened. Be prepared to explain your diagram to other students.
- Find another way to model your thinking. Be prepared to share your model in class.

1. Describe what you did to create your model:

2. What are two ways your model accurately shows your ideas on what happened to the pod?

3. What are two ways your model does not accurately show your ideas on what happened to the pod?



GO TO KAHOOT.IT

KAHOOT!

