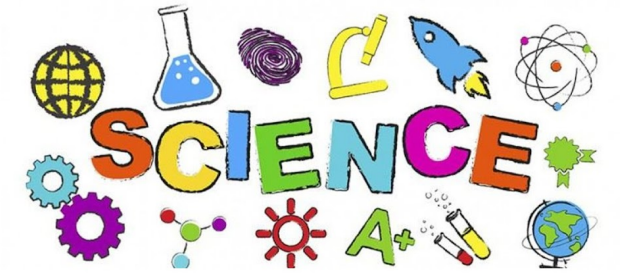
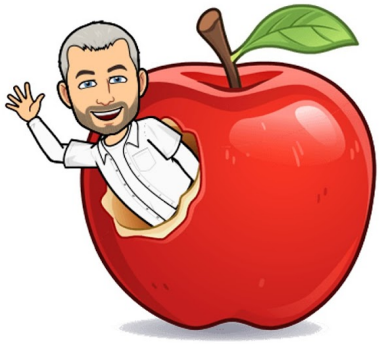




Volume

What I Will Be Learning In This Mastery Badge:
In this mastery badge we will learn how to calculate the volume of various objects, including those with regular and irregular shapes.

What This Packet Includes:
It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.

III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

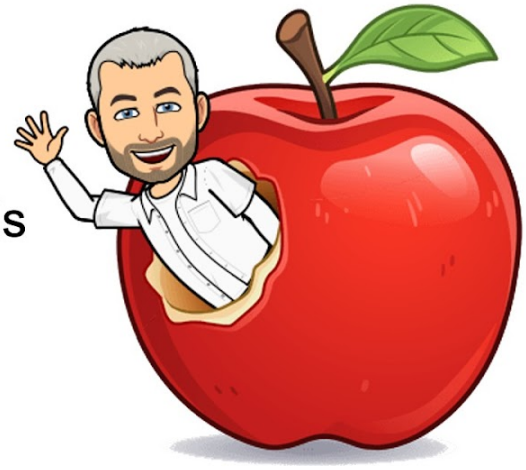
Some of the most important things we will learn in this mastery badge:

- What is volume?
- How do you calculate the volume of a regular shaped object?
- Most objects are not regularly shaped. How do we calculate their volume?
- Water Displacement
- The Archimedes Principle

Name:_____ Date:_____

Discovering Lab

Learning Through Hands On Activities



Activity: Discovering Volume

Directions: Follow the steps below to discover how what volume is, and how it is calculated.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about volume

Step 1: Discovering that objects take up space.

1. Fill a sink halfway up with water.
2. Using a dry-erase marker, carefully mark the level of the water.
3. Find objects around your home that are waterproof, like bowling balls, rocks, or toys. Add them to the water.
4. Observe what happens to the level of water.

What happened to the water level, when you added items to the sink?

Why do you suppose this happened?

Step 2: Calculating how much space an object takes up
In the last experiment you observed that objects take up space and that when we add these objects to water the space they take up causes the water level to rise.

Scientists use the word “volume” to refer to how much space an object takes up. Now we are going to learn some methods that you can use to calculate how much space an object occupies or takes up in the Universe.

1. Find an object in your home that is square or rectangular. Such as a box.

2. To calculate the volume of this object, we need to measure its width, height, and length. Scientists use centimeters when they take measurements like this.

3. How many centimeters long is your object?

4. How many centimeters wide is your object?

5. How many centimeters tall is your object?

6. Volume (or how much space an object takes up) is measured by multiplying the width times the length times the height. (W X L X H).

7. Calculate the volume of your object by using this formula. V=W x L x H

Step 3: Water Displacement
Most objects are not square-shaped, and as such, we can’t use the formula described earlier. It would simply be too difficult. How then do we calculate the volume of these objects?

Based on the first experiment you did, can you think of a way we might cheat? In the first experiment we observed that water is displaced when we drop objects into it. How do you think we might use this fact to our advantage? How might we use water displacement to measure the volume of an object?

To learn how to use water displacement to calculate volume, fill a graduated cylinder with water. A graduated cylinder has small lines on the side. Take note of the water level. Then add a rock or marble to the graduated cylinder and observe how much the water increases.

Note: If you do not have access to a graduated cylinder you can purchase one from HandsomeScienceTeacher.com. A viable alternative would also be a graduated measuring cup used for cooking.

1. What happens to the level of water when you add a rock or marble to the graduated cylinder?

2. Did you notice that it is possible to measure the amount of water that is **displaced** by the irregularly shapped rock?

   Example: If the water level started at 20 ml and then went up to 26 ml, then the water would have increased by 6ml. In your own experiment how much did the water go up?

3. How do you think this water displacement might relate to volume?

Final Questions:
Remember to answer all your questions using complete sentences.

1. What is volume?

2. What is the formula for calculating the volume of regular shaped objects?

3. How can we calculate the volume of irregular shaped objects?

4. Draw a picture showing your graduated cylinder both before and after you added the rock or marble. Make sure that you label the graduations on the side of the cylinder.

Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don't understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:

Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

Check Point

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I watched the video carefully, and paused to look up anything I didn't understand.

Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

Ten Things I Learned From This Video

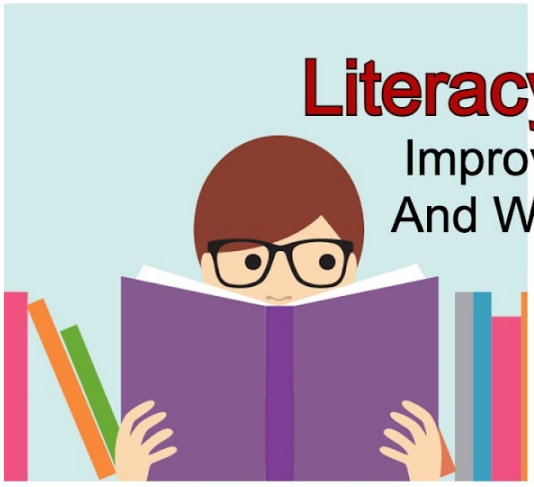
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

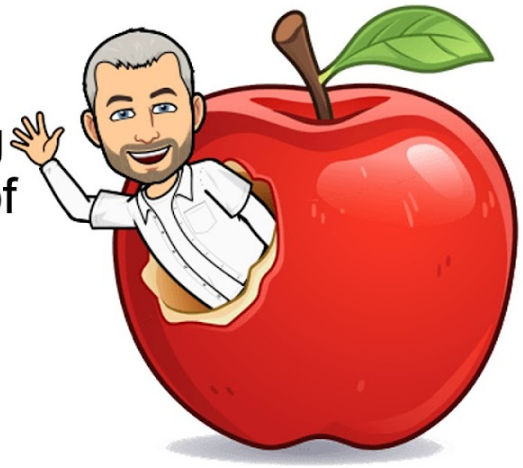
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Now, Let's Connect These New Concepts To Things You Already Knew

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?





Activity: Reading And Writing

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

1. **Practice Reading For Understanding**
   Read the article below **for understanding** Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it.**

2. **Practice Writing To Communicate**
   Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:

Read The Assigned Article Carefully For Understanding.
https://handsomescienceteacher.com/Online-science-classes-kids/the-archimedes-principle/

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

Check Point

Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I Read For Understanding. I did not skim the articleI understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let's Write To Communicate

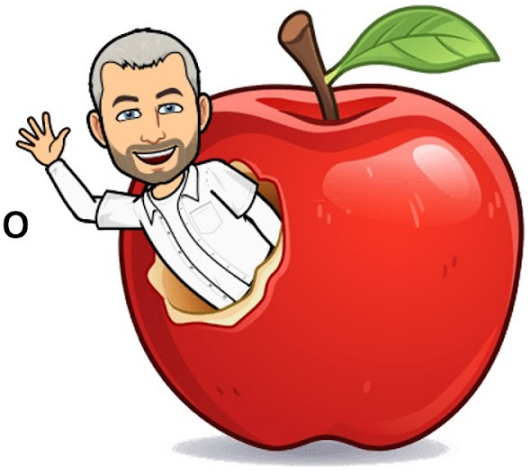
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words explaining how Archimedes discovered water displacement, and what water displacement tells us about the volume of an object.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Activity: Applying Volume By Solving Problems

Directions: Follow the instructions below to measure the volume of several objects.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To demonstrate your understanding of what volumeis, and how it is calculated.

Regular-Shaped Objects

Step 1:

Collect a ruler or tape measurer and three regular (square) shaped objects.

Step 2:

Obtain the volume of these three objects.

Object # 1: _____

Draw a picture of your object:

Width: _____ mm. Height: _____ mm. Length: _____ mm.

Volume: Width **X** Height **X** Length = _____ mm^3.

Object # 2: _____

Draw a picture of your object:

Width: _____ mm. Height: _____ mm. Length: _____ mm.
Volume: Width **X** Height **X** Length = _____ mm³.

Object # 3: _____

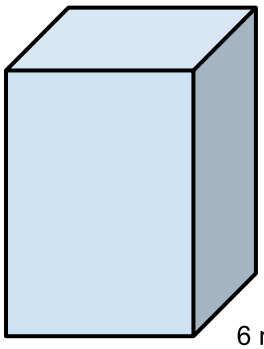
Draw a picture of your object:

Width: _____ mm. Height: _____ mm. Length: _____ mm.
Volume: Width **X** Height **X** Length = _____ mm³.

Step 4:
Calculate the volume of the objects shown.

Volume: Width **X** Height **X** Length = _____ mm³.

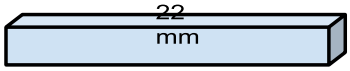
8 mm



12 mm

Volume: Width **X** Height **X** Length = _____ mm³.

6 mm



22 mm

3 mm

Volume: Width **X** Height **X** Length = _____ mm³.

Irregular-Shaped Objects
Use a graduated cylinder to calculate the volume of three irregularly shaped objects.

Object # 1: _____

Draw a picture of your object:

How much water was displaced: _____ml
What is the volume of this object: _____ml

Object # 2: _____

Draw a picture of your object:

How much water was displaced: _____ml
What is the volume of this object: _____ml

Object # 3: _____

Draw a picture of your object:

How much water was displaced: _____ml
What is the volume of this object: _____ml

Final Questions:

Answer each question using complete sentences.

1. **What does mass measure?**

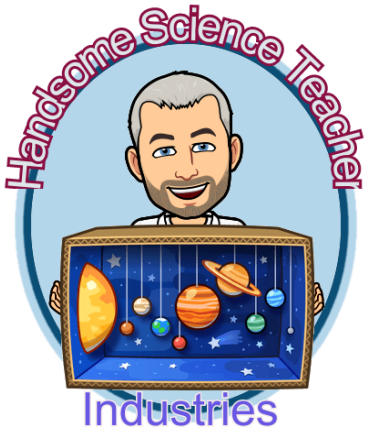
2. **What does volume measure?**

3. **How is volume similar to mass?**

4. **How Is volume different than mass?**

5. **What is the formula for the volume of regular-shaped objects?**

6. **Draw a picture of a regular-shaped object such as a box. Label the box with a fictional length, width, and height. Then using the formula for volume calculate the volume of your box.**



Congratulations! You Have Completed The Entire Mastery Badge
You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work
Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:
Based on the criteria listed above, I believe I have passed off this Mastery Badge because… (Be detailed ans specific)

Mastery Badge Counselor Evaluation:
I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because… (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

Student's Signature	Date	Signature of Mastery Badge Counselor	Date

Certificate For Your Homeschool Records

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

Keep this on file as evidence of your successful completion of this topic.
If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.