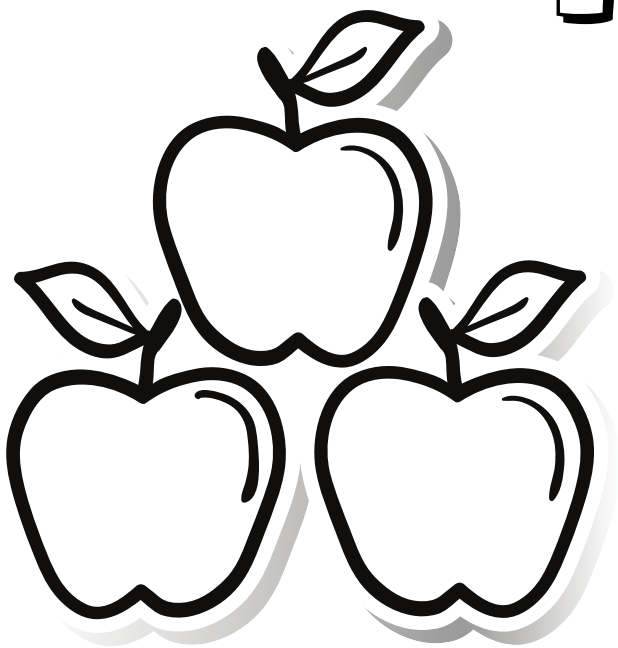
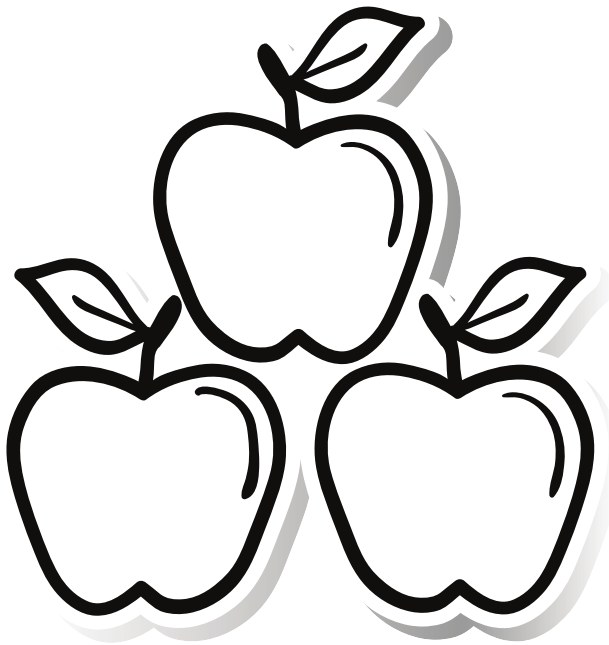
STEMSPARK

Presents

Apple Lab!





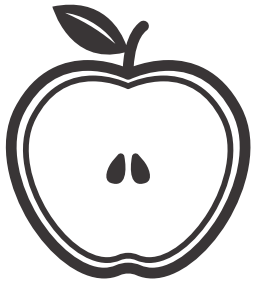
Apple Lab

Every year, Americans eat almost 17 lbs of fresh apples. Apples contain lots of important nutrients that help keep us healthy. One study found that consuming 2 apples a day helps to combat heart disease.

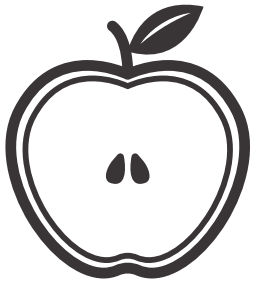
Further, apples have been around for long time and has been the star of everything from Greek mythology to scientific discovery! Today, we are going to learn about the science of apples (pomology).

In this lesson, we will learn about:

1. The anatomy of apples
2. How to grow apple trees from seeds
3. How to preserve apples from rotting
4. Why apples can taste so differently
5. How an apple helped change the world!



Apple Lab



Activity #1: Apple Anatomy

In this activity, we are going to learn about the structure of apples.

Materials

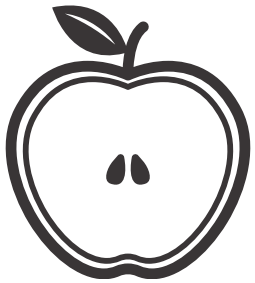
- Two apples of different colors
- Peeler
- Knife

Science Best Practices:

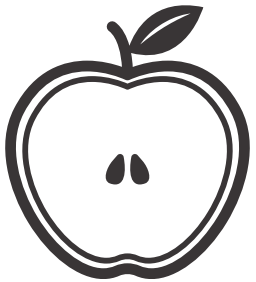
Science tools are objects that help you complete an experiment or activity. In this experiment, a knife is a science tool because it helps us dissect the apples. Science tools can be dangerous, so be careful, and only use with your adult safety partner

Directions:

1. Print out the Apple Anatomy Worksheet on the next page
2. Place the page in a plastic baggie or laminate it so it does not get messy from the apples
3. Peel and cut up the apple in front of kids
4. Sort each of the part of one apple into the correct boxes
5. Repeat with second apple to show that all apple varieties have the same structure.
6. Complete the compare and contrast chart



Apple Anatomy!



Stem

Skin

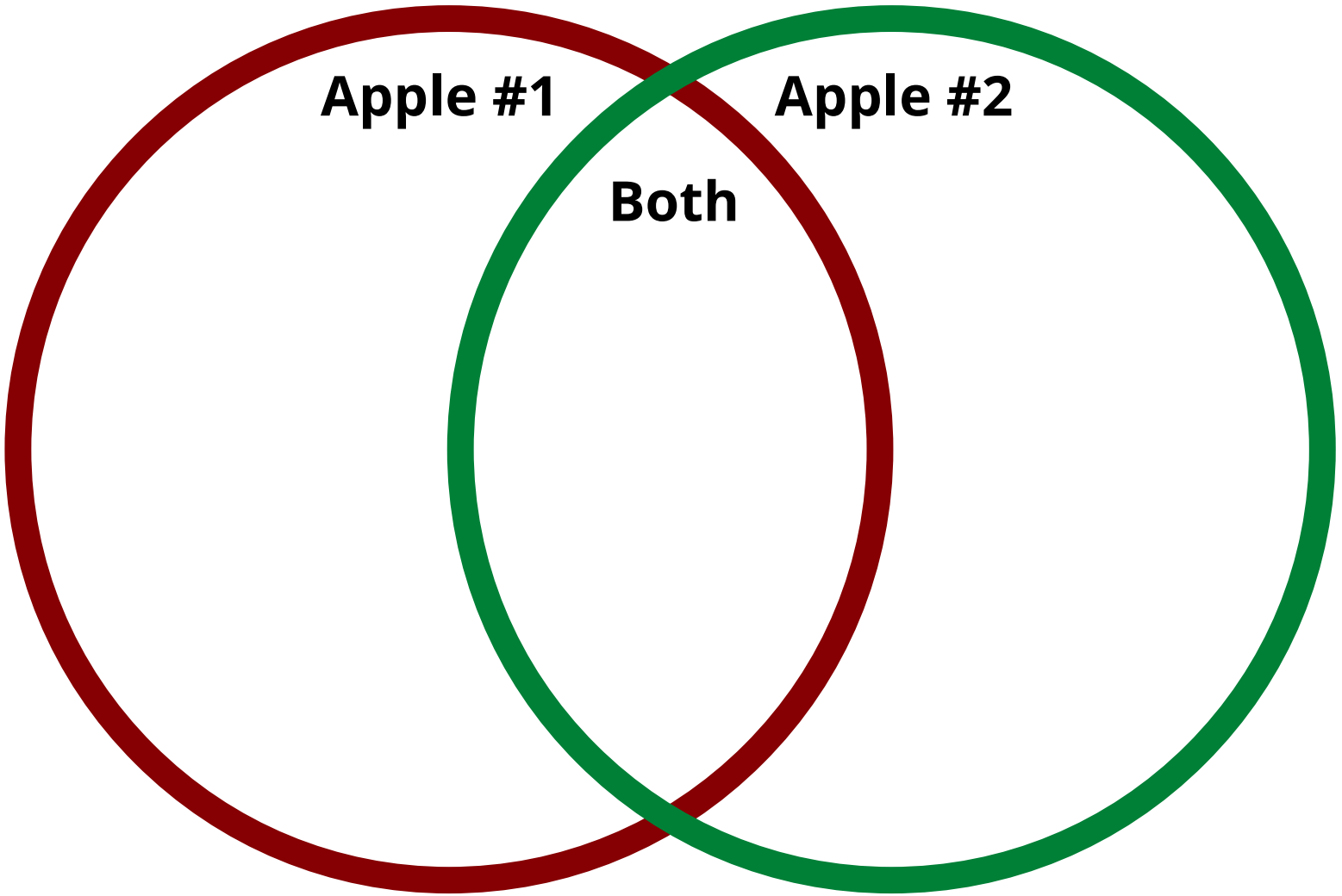
Core

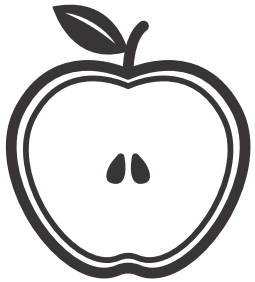
Fruit

Seeds

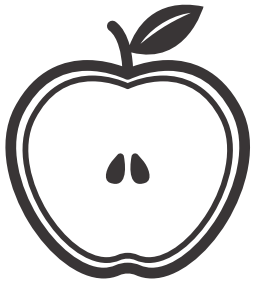
Apple Anatomy!

Compare and Contrast





Apple Lab



Activity #1: Apple Anatomy
Activity Wrap-Up

In this activity, we learned about the structure of an apple.

Every apple has 5 basic parts:

1. Skin- this part is the thin layer on the outside of the apple
2. Stem- this is the part of the apple that connects to the tree
3. Fruit- this is the sweet part of the apple that has all the nutrients
4. Core- this is the center of the apple that holds the seeds
5. Seeds - these are the small, hard objects in the middle of the apple. The seed is what makes a new apple tree!

Even when we cut-up a different color and variety apple, it had the same parts. On the inside, apples are all alike!

Apple Lab

Activity #2: Seed Sprouts

Like most fruits, apples grown on trees. But how to apple trees grow? They grow from seeds!

In the previous activity, you found apple seeds inside the core of an apple. We are going to use those seeds to learn how apple trees grow!

Which condition do you think will help the apple seeds grow?

My hypothesis:

I think the **soil / wet paper towel / baggie** will grow the seeds the best.

Apple Lab

Activity #2: Seed Sprouts

Materials

- 3 Apple Seeds
- Cup with dirt
- Wet paper towel
- 2 plastic baggies

Directions:

1. Fill a small cup with dirt from outside
2. Push a seed about an inch deep
3. Add water until soil is moist
4. Wet a paper towl and place a seed in the paper towel
5. Carefully, slide the wet paper towel into a sandwhich baggie
6. Squeeze out any air and seal the baggie shut
7. Place a seed inside a second sandwhich bag
8. Place all three in a spot with direct sunlight such as a window sill
9. Observe the seeds 3, 7, 14 and 30 days later.
10. Draw your observations on the Seed Sprout Observation Sheet

Apple Lab

Seeds • Dirt • Wet Paper Towel • Baggie

	Day 3:	Day 7:	Day 14:	Day 30:
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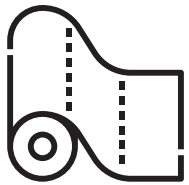
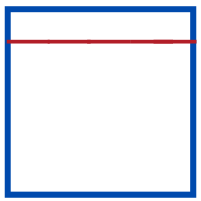
2					
3					

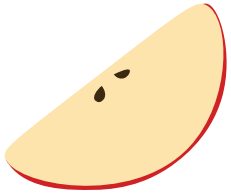
Apple Lab

Activity #2: Seed Sprouts
Activity Wrap-Up

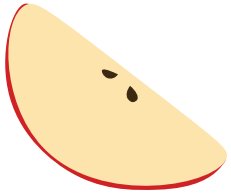
In this activity, we learned about what a seed needs to grow

Every apple seed needs at least:

1. **Water-** This is really important for all life, even humans! Nothing on Earth can survive without water!
2. **Sunlight**- Plants need the sun. Plants change sunlight into food, so sunlight is really important!
3. **Soil-** Even though a seed might sprout in a wet paper towel, it will eventually need soil to grow. Soil provides important nutrients for plants to get big and strong.



Apple Lab



Activity #3: Preservation Task

Food producers have the tricky task of keeping produce fresh and edible from the time it gets harvested to the time it is bought. They do this through preservation, which means to keep things from rotting, ew!

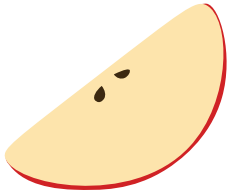
In this experiment, you are going to explore ways to keep your apple slices from going bad so you can eat them now or pack them away for later snacking!

We are going to test 6 methods of preservation.

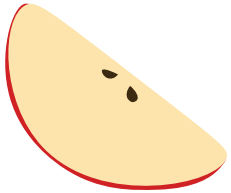
Which do you think is going to keep apples the freshest?

My hypothesis:

I think the **lemon juice / apple juice / apple cider vinegar/ ice/ nothing** will keep apples the freshest



Apple Lab



Activity #3: Preservation Task

Materials

- Apple, peeled and cut into 6 pieces
- 6 small cups
- 2 tbsp lemon juice
- 2 tbsp apple juice
- 2 tbsp apple cider vinegar
- 2 tbsp water
- 2 ice cubes

Directions:

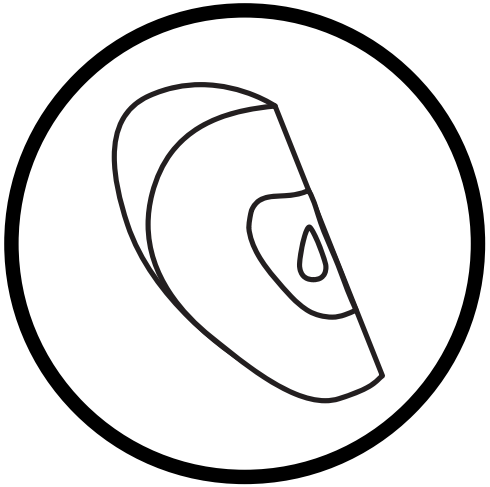
1. Print out the Preservation Task Worksheet below
2. Place a chunk of apple into each cup
3. Fill a cup with lemon juice, water, apple juice, and apple cider vinegar until the apple chunk is submerged. Put two ice cubes on one cup, and leave one cup alone
4. Place each cup in the appropriate spot on the worksheet to keep track of which is which
5. After two hours, come back and observe how much browning has occurred.
6. Color the apple slices according to your observations

Apple Lab

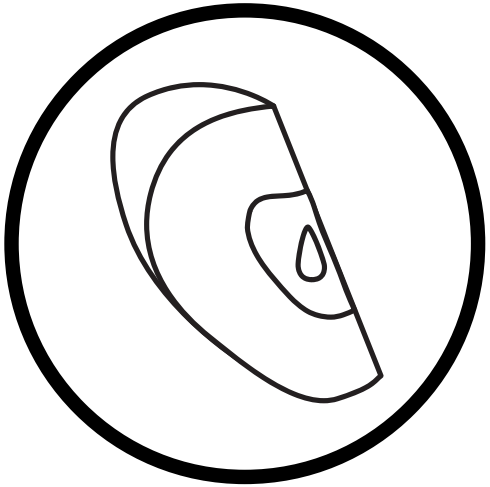
Activity #3: Preservation Task

After 2 hours, observe the apples and color each apple slice below

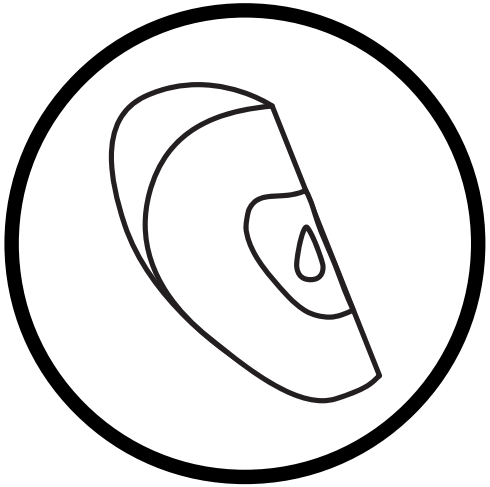
Lemon Juice

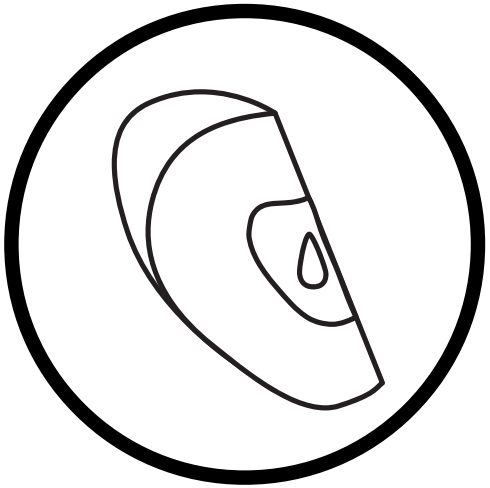


Apple Juice

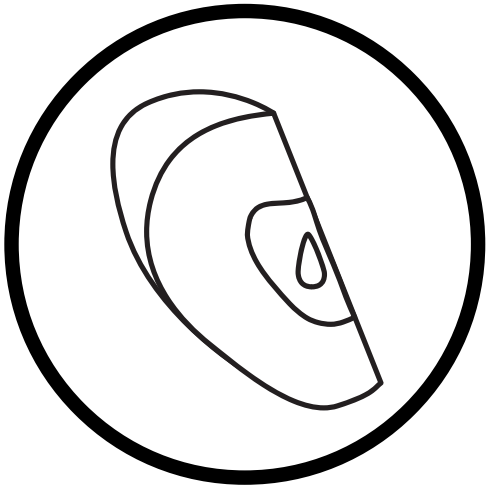


Nothing

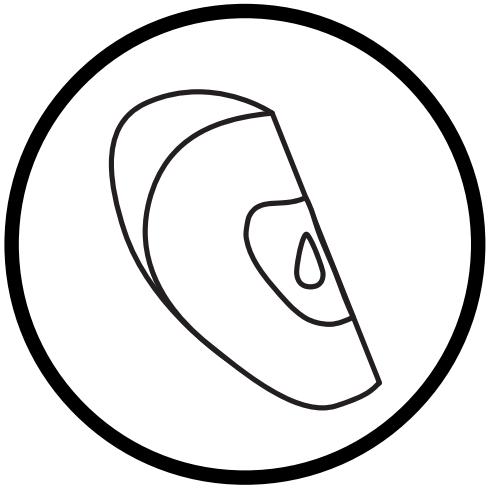




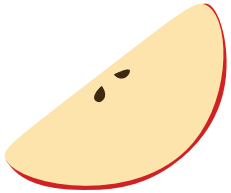
Apple Cider Vinegar



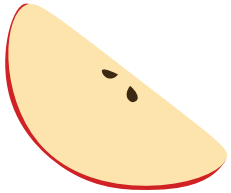
Ice



Water



Apple Lab

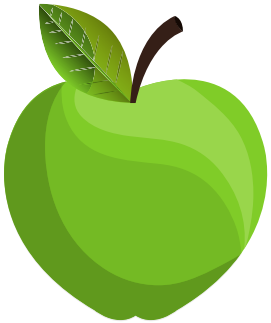


Activity #3: Preservation Task
Activity Wrap-Up

When you cut apples, they get exposed to the air. The apples then begin to have a chemical reaction to the air that causes the apples to turn brown and get mushy. To prevent apples from turning brown, we can use preservatives to protect the apples from the air and keep them fresh.

You should have observed that lemon juice did the best at keeping your apples from turning brown, but all methods (except for nothing) should have prevented some of the reaction.

In addition to what works best, think about how these preservatives might change the taste of the apples. Which method do you think keeps the apples the freshest, but also changes the taste the least?

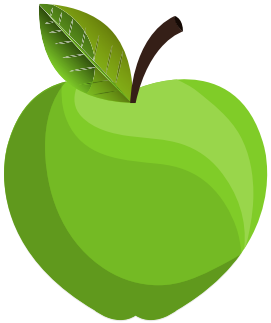


Apple Lab

Activity #4: Blind Taste Test

Did you know there are over 7,500 different types of apples! Each variety has its own appearance and taste. The top 5 most common apples in the US are Gala, Red Delicious, Fuji, Granny Smith, and Honeycrisp.

Fuji and Granny Smith are two apples that both look very different as well as taste very different. Granny Smith apples are known to be vary tart, while Fuji tend to be very sweet. In this activity, we are going to test the palate in a blind taste-test!



Apple Lab

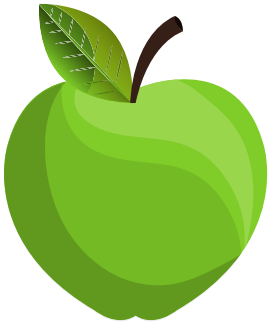
Activity #4: Blind Taste Test

Materials

- Sharpie
- 2 small cups
- Fuji apple, peeled and cut up
- Granny Smith apple, peeled and cut up

Directions:

1. Label the cups with the numbers 1 and 2. On the bottom, put "GS" for Granny Smith on one cup and "F" for Fuji on the bottom of the other cup. Put the cut-up apple in their respective cups
2. Ask 20 people to sample a piece of apple from each cup.
3. Ask them if the apple they ate was sour or sweet. Tally their response on the Blind Taste Worksheet
4. Be sure they have a sip of water or wait a couple of minutes between each apple sample to reset their taste buds.
5. At the end, count up the tallies. Then flip over the cups to reveal which apple people thought was sweet and which was sour

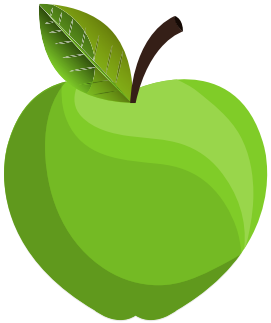


Apple Lab

Activity #4: Blind Taste Test

Granny Smith Apple • Fuji Apple

	Sweet	Sour
1 This apple is **Fuji** **Granny Smith**	**Total**	**Total**
2 This apple is **Fuji** **Granny Smith**	**Total**	**Total**



Apple Lab

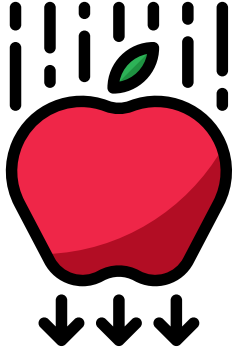
Activity #4: Blind Taste Test

Apples taste differently because they contain different amounts of sugar. Sugar is what makes food sweet.

Granny smith apples can have as low as 12% of sugar, where Fuji and Honeycrisp apples can be up to 18% sugar.

Sweetness is one of the easiest tastes for humans to sense, and so is sourness, so this should have been an easy task, but individual tastes differ. What may be sweet to one person, might be sour to another. Were there any people you surveyed who said both apples were sweet, or both were sour?

Apple Lab



Activity #5: STEMSpark Stumper
Newton's Apple

Did you know, an apple helped change the world? A long time ago there was a famous scientist named Issac Newton. He observed an apple fall from a tree and discovered gravity.

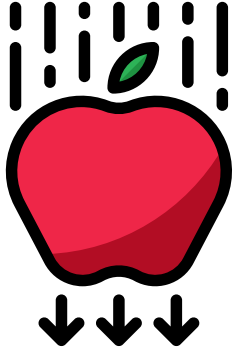
Gravity is a force that pulls objects to the Earth. You observe gravity all the time when things fall down. In this activity, we are going to replicate another famous scientist, Galileo, and his gravity experiment. We will drop a big apple and a small apple from the same height to observe gravity on Newton's apples.

What do you think will happen when we drop a big and small apple?

My hypothesis:

I think the **big / small** apple will hit the ground first

Apple Lab



Activity #5: STEMSpark Stumper
Newton's Apple

STEMSpark Tip:
Galileo dropped his objects outside. We also recommend doing this experiment outside to prevent water spills. If done inside, put down a towel to avoid a more painful experience with gravity (slip and fall).

Materials

- 1 large apple
- 1 small apple
- 2 large bowls of water

Directions:

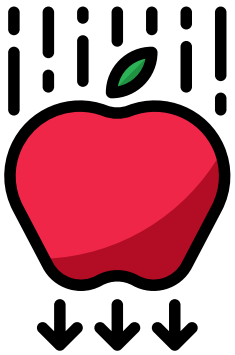
1. Place the two bowls of water on the ground
2. Stand on a chair or get to a high point
3. At the same time, drop the small and large apple over the bowls of water
4. Observe which apple splashes into the water first
5. Repeat this experiment 5 times

Apple Lab

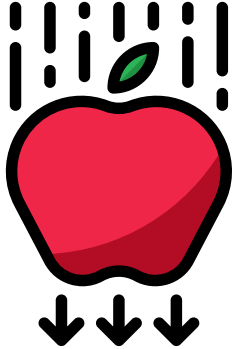
Activity #5: STEMSpark Stumper

Newton's Apple

For each trial, put an X in the box of the apple that hit the water first. At the end, add up how many times each apple hit the water first

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Result
						5
						5

Apple Lab

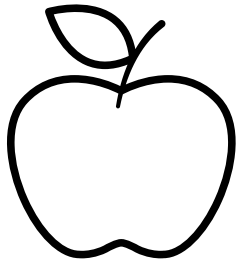


Activity #5: STEMSpark Stumper
Newton's Apple

In this activity, you should have observed that the big apple fell faster than the small apple. That is because the big apple has more mass. The bigger an object is, the more force gravity exerts on it.

Besides mass, there is one other thing that affects gravity's pull, which is distance from the Earth. The further you get away from the Earth's surface, the weaker gravity it.

So if you dropped an apple from a very tall building, the closer it got to Earth, it would fall faster and faster the closer it got to the ground because gravity becomes stronger!



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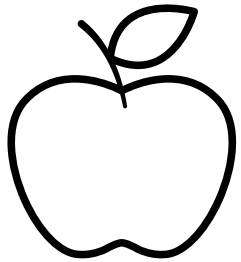

Lesson Exit Ticket

1. Which of the following is NOT part of an apple's structure? **Seed / Skin / Stem / Leaves**
2. Seeds need water, sunlight and **soil/ air** to grow.
3. Apples turn brown because they are reacting to the **air/ water.**
4. Some apples are sour and some are sweet because apples have different amounts of **salt/ sugar.**
5. Apples fall at different speeds because they have different **colors / masses.**