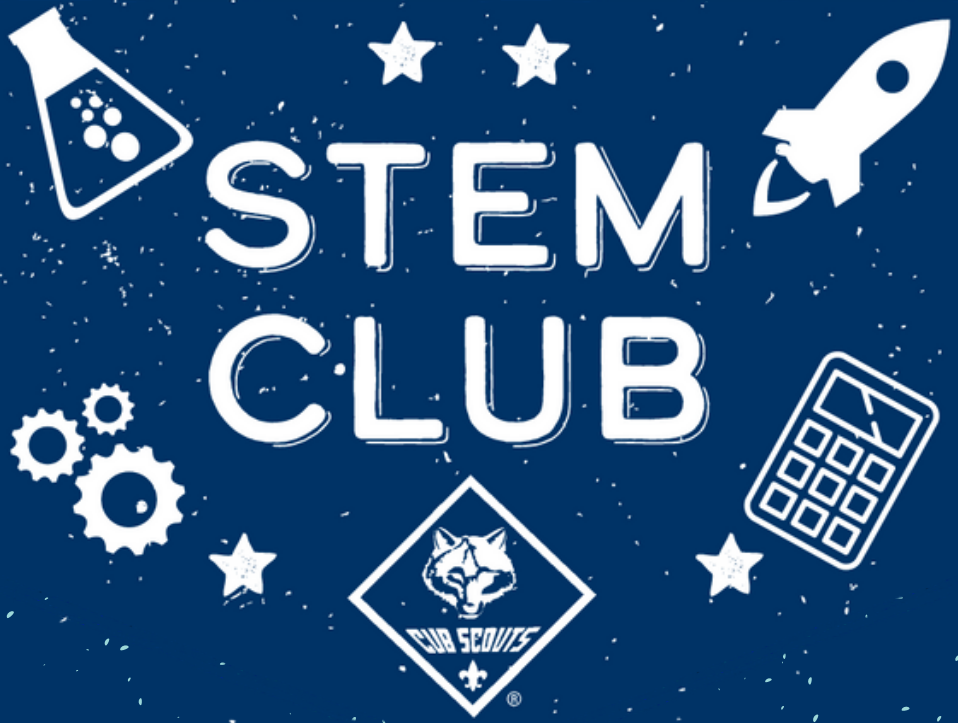


LAB MANUAL OF ACTIVITIES

GLOSSARY

- **Hypothesis**: An educated guess
- **Control**: The part of your experiment that always stays the same
- **Variable**: One part of your experiment that you change to see how it effects your experiment results
- **STEM**: An acronym that stands for "Science, Technology, Engineering, and Math"
- **Beaker**: A small glass or plastic cup used to measure liquids for science experiments
- **Pipette**: A small tube with a squishy bulb on one end used to transfer liquids for experiments
- **PPE**: An acronym that stands for "Personal Protective Equipment" like glasses, gloves, and a lab coat
- Reaction: A reaction is when something happens because two or more things got mixed together, or got close to each other.
- Molecule: A molecule is a really, really tiny object that makes up everything around us. They are the smallest amount of something that is possible. (one water molecule is the least amount of water you can ever have)

WELCOME TO STEM CLUB!

Dear Scientists and Mission Control (Adults): This Lab Manual you are holding is filled with many fun & exciting activities for you to enjoy. Each activity relates to one area of STEM Study - Science, Technology, Engineering, or Mathematics. Once you get set up for the activity, a lot of them can be done with minimal adult supervision - but always have Mission Control approve working alone on something.

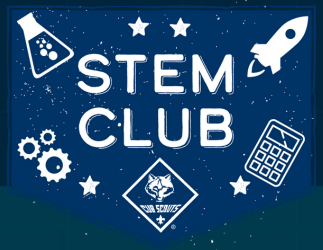
Always remember - in STEM anyone can stop the work at anytime if they feel there is a safety violation! Some activities require little to no supplies & are meant to help you enhance your scientist skills. For example - one activity is a nature walk searching for liquids, solids, and gasses. This will help your observation skills & give you a better understanding of the world around you while introducing you to 'matter'. Inside these pages you will find Science Experiments, Engineering Challenges, learn how much you weigh in outer space, and you'll even get a chance to decode a secret spy message using ASCII Code! Some of the activities may even help you understand one of the eleven NOVA Awards or one of the Supernova awards!

As you complete your activities, you may have questions. Make a list of questions and with a trusted adult (and after earning your Cyber Chip), use the internet to research your questions. You may also head to the library to find the answers in a book, or your trusted adult may know a professional that can help answer you questions. STEM is all about learning, asking questions, investigating and testing.

In addition to the fun waiting in these pages, you will also find other useful information like:

- Glossary: Common science terms that you may see in this Lab Manual.
- Scientific Method: Explained for you, so you can use it with each activity

This STEM Club Lab Manual was originally created for the 2020 Summer Adventure Club Program. It has been revised and made available to you as part of the 2021 Spring Programming from Cascade Pacific Council. Have fun!



SCIENTIFIC METHOD

HEY SCIENTISTS!

Science is around you everywhere you look! As scientists, we use The Scientific Method as an organized way to help us answer a question or begin to solve a problem. The scientific method has five basic steps:

- **Ask a question** - Make observations and do your research. What do you notice? What do you want to learn?
- **Form a hypothesis** - A hypothesis is an educated guess that you think answers your question and is best formulated when it is an "if X then Y" statement. Read, study and explore as much as you can about the topic you are exploring. The more you know, the better your hypothesis will be. After you do your research try to come up with a hypothesis that you think might answer your question. It is okay if your hypothesis is wrong, that is why you will test it by doing experiments. The point of a hypothesis to create your best "educated guess" for your question.
- **Do an experiment** - Now is the fun part! You get to do your test or procedure to see if your prediction, or hypothesis is correct. Your experiment must help you answer your hypothesis. Part of your experiment should be constant, or what is called the control (That means it stays the same for every test) and another part of your experiment has the condition you are testing in your hypothesis.

- **Record your analysis** - As you do your experiment, be sure to record what happened, this is also known as data. Data can be gathered in many ways. Some of them include counting, measuring, weighing, and note taking.
- **Form a conclusion** - You did all the work, now you can share what you learned. Was your hypothesis correct? Did you discover something new while doing your experiment? Could your conclusion lead you to another set of questions that then has you do a new version of your experiment?

The scientific method is used in all sciences—including chemistry, physics, geology, and psychology. The scientists in these fields ask different questions and perform different tests. However, they use the same core approach to find answers that are logical and supported by evidence.

Now that you know The Scientific Method, you can use it to help you ask the big questions, create fun experiments and explore the world around you!

NOTES ON SCIENCE

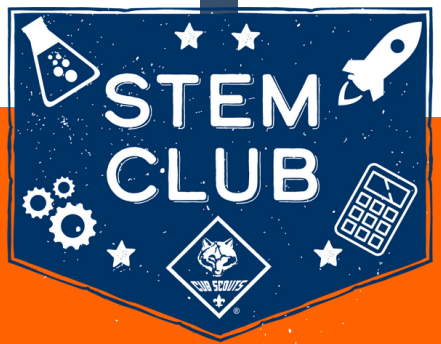
A SCIENTIFIC METHOD OUTLINE

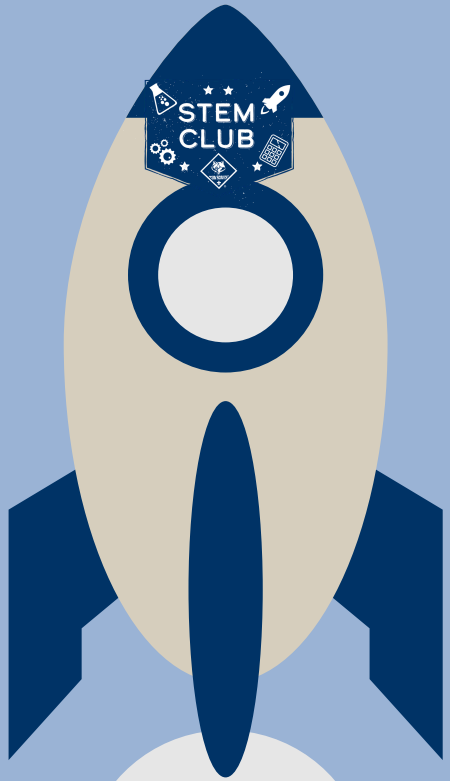
ASK A QUESTION:

COME UP WITH A HYPOTHESIS:

TIME TO EXPERIMENT:

COME TO A CONCLUSION:





SCIENCE PROJECT PLANNING

Use this template to help you plan your science project and use the Scientific Method to get to your conclusion. If you ever have a Science Fair, you would follow a similar outline.

MY QUESTION:

HYPOTHESIS:

MATERIALS:

PROCEDURE:

CONCLUSION:

ACTIVITIES INDEX

(SORTED BY NOVA AWARD)

OUT OF THIS WORLD

- Constellation
- Toilet Paper Solar System
- Sun Dial
- Moon Journal

SWING

- Build A Kite
- Fold And Fly - Paper Airplanes
- Levers
- Playground Lever
- Build A Pendulum
- Build A Catapult
- What's Inside?
- House of Cards

UP AND AWAY

- Balloon Hover Craft
- Do Oil and Water Mix?

UP AND AWAY (CONTINUED)

- Terminal Velocity
- Make A Boat That Floats

STEM JOKES

UNCOVERING THE PAST

- Ice Fossils

NOVA WILD

- Grow A Plant From Seeds
- Record Birds On A Nature Walk

DOWN & DIRTY

- Chart the Temperature
- Cloud Predictions
- Be A Meteorologist
- Aquatic Ecosystems

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ACTIVITIES INDEX

(SORTED BY NOVA AWARD)

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WEEK 1 STEM CLUB NOTES
UNCOVERING THE PAST

TOPIC COVERED:

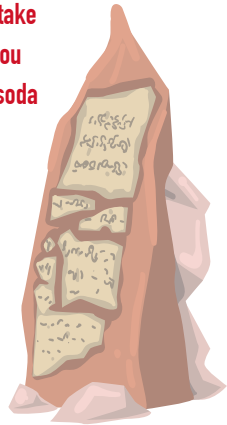
- Differences between Artifacts, Ecofacts, and Physical Remains
- Hot Dog Mummy

FURTHER QUESTIONS:

MAIN TAKEAWAYS:

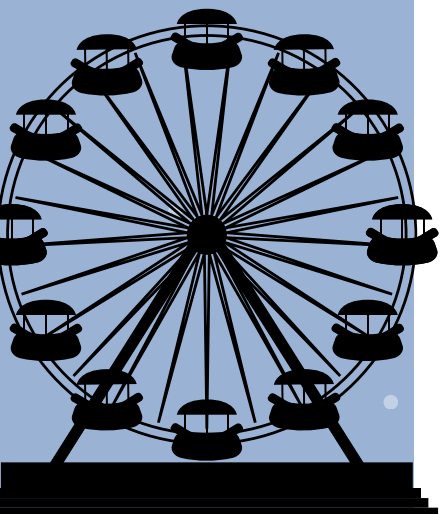
ADDITIONAL NOTES:

- Check hot dog in 7 and 14days and take measurements. What changes do you notice? Cover back up with baking soda each time.



LEARN MORE BY READING OR WATCHING:

- Archaeological Institute of America: https://www.interactivedigs.com/
- "Fossils for Kids": https://www.youtube.com/watch?v=tyOjxjFHW-c
- Junior Ranger Archaeology Program: https://www.nps.gov/mwac/junior/juniorRangersweb.pdf
- Other Junior Ranger programs: https://www.nps.gov/kids/junior-ranger-online.htm



WEEK 2 STEM CLUB NOTES
SWING

TOPIC COVERED:

- Lever Classes 1, 2 and 3
- Built 2 Catapults

FURTHER QUESTIONS:

MAIN TAKEAWAYS:

ADDITIONAL NOTES:

LEARN MORE BY READING OR WATCHING:

- https://youtu.be/lueqE0lxLyc
- Technologystudent.com Website: www.technologystudent.com/forcmom/lever1.htm

WEEK 3 STEM CLUB NOTES
UP AND AWAY

TOPIC COVERED:

- Terminal Velocity
- Parachutes

FURTHER QUESTIONS:

MAIN TAKEAWAYS:

ADDITIONAL NOTES:

LEARN MORE BY READING OR WATCHING:

- "The STEM of Indoor Skydiving" – https://youtu.be/V5jJ5FaX1ZU
- Full Pinewood Derby Science Video: https://youtu.be/a5A6SCE0eVw
- Documentaries produced by PBS (such as "NOVA"),
- Discovery Channel, Science Channel, National Geographic Channel, and the History Channel

WEEK 4 STEM CLUB NOTES
OUT OF THIS WORLD

TOPIC COVERED:

- Constellations
- Eclipses
- Build a Sextant – Find your latitude

FURTHER QUESTIONS:

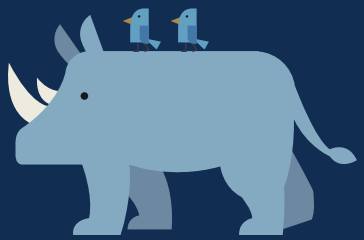
MAIN TAKEAWAYS:

ADDITIONAL NOTES:

- With your parent's permission, visit a website for young scientists or astronomers and investigate the learning activities: Young Astronomer, Kids Astronomy, Young Stargazers, and NASA StarChild.

LEARN MORE BY READING OR WATCHING:

- Story of the Hubble Space Telescope: https://youtu.be/Lo43Gq_Xe1M
- What are Stars? – https://youtu.be/ZrS3Ye8p61Y



WEEK 5 STEM CLUB NOTES
NOVA WILD

TOPIC COVERED:

- What is an Ecosystem
- What is Biodiversity
- Bottle Garden Build

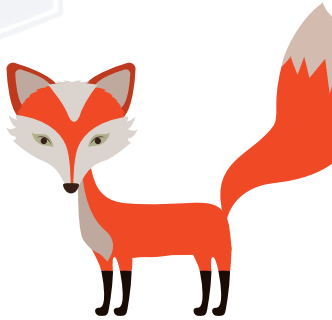
FURTHER QUESTIONS:

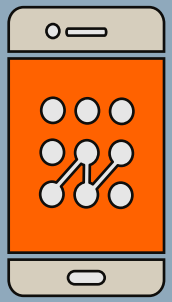
MAIN TAKEAWAYS:

ADDITIONAL NOTES:

LEARN MORE BY READING OR WATCHING:

- Crater Lake National Park 3D Tour: https://youtu.be/_Qq9H9Hr5Kw





WEEK 6 STEM CLUB NOTES
CUB SCOUTS CAN CODE

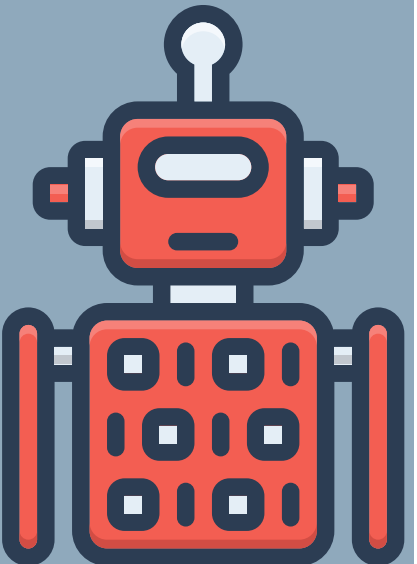
TOPIC COVERED:

- History of Computers
- How computers have changed since invention
- Experiment with our own set of computer condidtions

FURTHER QUESTIONS:

MAIN TAKEAWAYS:

ADDITIONAL NOTES:



LEARN MORE BY READING OR WATCHING:

- How Do Computers Work? – https://youtu.be/P2Fc0Aj_u58s

WEEK 7 STEM CLUB NOTES
FEARFUL SYMMETRY

TOPIC COVERED:

- Reflectional, Rotational, Translational, and Bilateral Symmetry
- Symmetry Difference of a Geranium and Periwinkle
- Reflectional Symmetry Artwork

FURTHER QUESTIONS:

MAIN TAKEAWAYS:

ADDITIONAL NOTES:

- Learn the difference of a sweetgum tree and a maple tree leaf arrangement
- Learn about the art form of Rangoli or Kolam and then create your own art piece

LEARN MORE BY READING OR WATCHING:

WEEK 8 STEM CLUB NOTES
STEM FAIR*

*USE THIS IF YOUR LEADER IS HOSTING A STEM FAIR, CHOOSE AN ACTIVITY FROM THE LAB MANUAL AND TEACH YOUR FRIENDS WHAT YOU HAVE LEARNED!

EXPERIMENTS OTHERS DID THAT I WANT TO TRY:

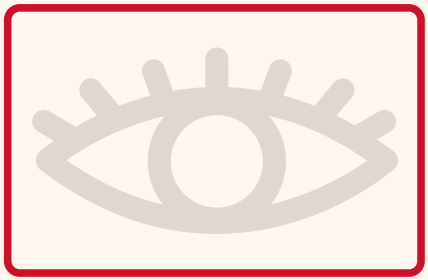
QUESTIONS TO RESEARCH:

ADDITIONAL NOTES:

LEARN THE FIVE SENSES

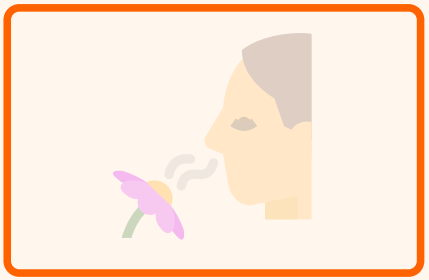
The five senses are necessary for us to experience the world around us, primarily through observing- a primary science skill.

I CAN SEE

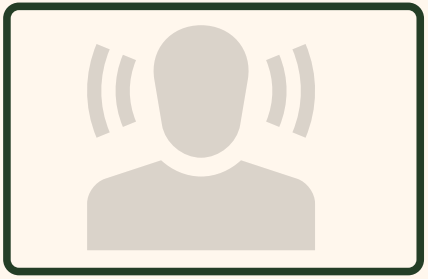


I CAN TASTE

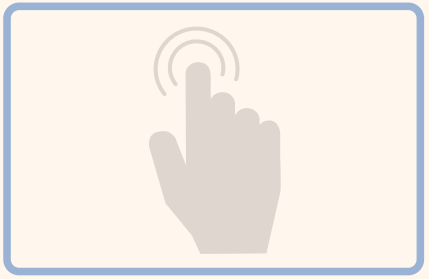
I CAN SMELL



I CAN HEAR



I CAN TOUCH



GENERAL STEM

Practice your observation skills above!

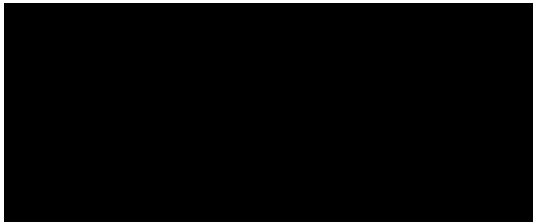
STEM CLUB

HOW TALL CAN YOU BUILD?

Buildings come in all shapes and sizes. Building engineers are tasked with designing and building these structures. They also have to figure out what shape the building will be and which design could be best used for the space available.

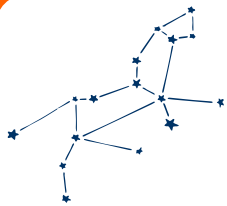
INSTRUCTIONS:

Use the shapes below as a guide. Try to build a Lego tower on top of the shapes and see how tall you can get it. Which tower is the tallest? Can you keep the tower shape and make it bigger? Does adding bricks on the outside of shape give it more support?

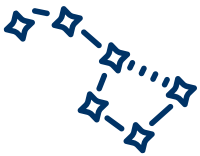


IDENTIFY A CONSTELLATION

The night sky is filled with amazing stars! You can do this activity anywhere, but we recommend viewing the night sky from somewhere with very little light pollution. That means somewhere without many city lights. This makes the stars seem brighter in the sky! Some images of constellations are below, see if you can find those or others in the sky near you. Draw what you find in the space below!



There are thousands of stars visible from Earth. Constellations are groups of those stars that make shapes. People have been looking at the stars and making constellations for thousands of years.



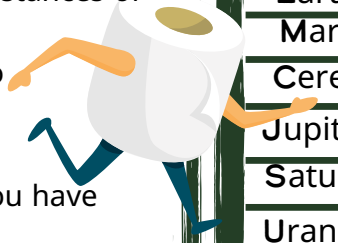
For great places to view the stars and camp: www.cpcbsa.org

TOILET PAPER SOLAR SYSTEM

Even in our own "cosmic neighborhood", distances in space are so vast that they are difficult to imagine. In this activity, you will create a scale model of the distances in the solar system. There are many ways you can do this, one fun way is with a roll of toilet paper! When doing this activity, remember that planetary orbits are ellipses, so the numbers represent the average distance from the sun. Also - the planets will never be in a straight line going out from the sun, as they are represented in this model.

DIRECTIONS

1. Make a dot on the seam between the first two sheets of toilet paper - This is the Sun
2. Write down the planets on pieces of paper so you can label the Solar System as you go
3. Use the distance chart to mark off distances of each planet.
4. Ceres, the largest asteroid is used to represent the Asteroid Belt.
5. One Hundred sheets of toilet paper stretch nearly 42 feet. Make sure you have room for your model before starting.



DISTANCE CHART

Planet	Actual km From Sun	Squares of Toilet Paper from Sun
Mercury	57,910,000	1.0
Venus	108,200,000	1.8
Earth	149,600,000	2.5
Mars	227,940,000	3.8
Ceres	414,436,363	11
Jupiter	778,330,000	13.2
Saturn	1,429,400,000	24.2
Uranus	2,870,990,000	48.6
Neptune	4,504,000,000	76.3
Pluto	5,913,520,000	100.0

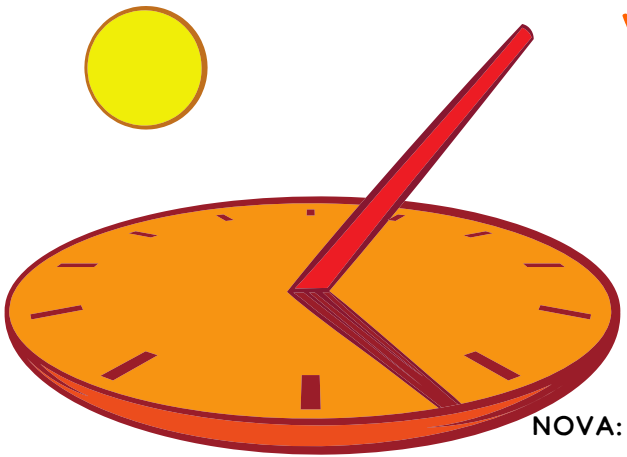
TELL TIME WITH A SUN DIAL!

REQUIRED MATERIALS:

8 Rocks, Lego or other Item; Pencil; Ball of Clay/Play-Doh

INSTRUCTIONS

1. Place pencil in ball of clay to create a 'pole'. This will be your gnomon (the middle piece that casts the shadow). Place your gnomon in a sunny spot that won't be disturbed.
2. At 9am, use a Rock (or other item) and mark where the shadow is.
3. Mark where the shadow is every hour until 4pm with a new rock.
4. The next day - try and tell time using your Sun Dial!.



WHAT'S THE SCIENCE?

A sundial uses the sun in the sky to tell time. This is one of the earliest time keeping devices that ancient cultures use. This activity could be done anywhere, just be sure it is a nice sunny day so that you can see the pencil's shadow.

NOVA: OUT OF THIS WORLD

STEM CLUB

CREATE A MOON JOURNAL

The **E**arth's moon is a sphere that revolves around our planet. **A**t times, our **S**uns rays shine onto the moon causing it to appear bright. **O**ther times, our **E**arth blocks the **S**uns rays and causes a shadow on the moon, making it seem smaller, taking on a different shape.
Get a notebook and track the moon for **1** month by drawing it each night.
Can you name the moon phase you are seeing**?** **H**ow often does the **M**oon **P**hase change**?**

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NOVA: OUT OF THIS WORLD

MOON PHASES

BUILD A KITE

When engineers try to build something for the first time, they usually don't build the best version of it. They often have to build several versions of it, and slowly make changes to try and make it better. This is called the "engineering process" and it is important to test multiple designs. It will help you develop the best design, and also give you hints about what actually makes it the best!

INSTRUCTIONS:

Using materials that you have around your house, build a kite and see if it flies. Try a few different designs that you think would work, and see which one flies the best. Using the Scientific Method and engineering process, write down the things that worked well, and the things that did not. Try and combine all of the things that worked really well to make the best kite.

NOVA: SWING

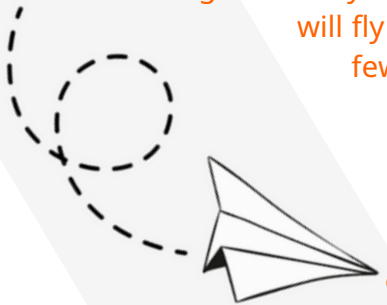
STEM CLUB

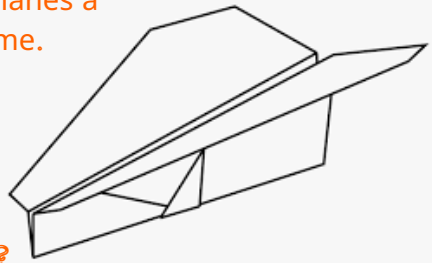
FOLD AND FLY

There are many different designs for airplanes in real life. They are all designed that way for different reasons. Some are designed to carry passengers, others for cargo, while some planes are made to get somewhere REALLY fast! There are also many different popular designs for paper airplanes.

INSTRUCTIONS:

With a parent's permission, get several pieces of paper, and make different paper airplane designs. After you have made multiple different designs, write down what plane you think will fly the farthest, and why you think it will. Fly all of your planes a few times and write down how far each one flies every time.





QUESTIONS TO ASK YOURSELF:

Which plane flew the farthest?
Was your prediction right?
What do you think the best paper airplane design is?
Can you modify the design using engineering process?
Can you find the average distance flown using math skills?

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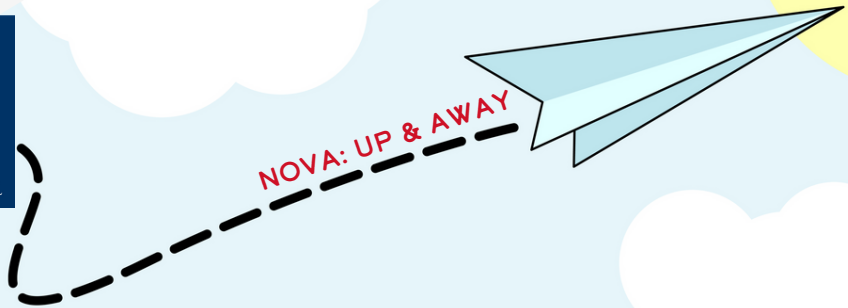


LEVERS

Levers are designed to give us something called "mechanical advantage." Mechanical advantage is used to make it easier for us to lift or move things that would normally be too heavy. Most people aren't strong enough to lift a car, but with mechanical advantage, people lift cars up all the time.

INSTRUCTIONS:

There are 3 classes (or types) of levers. With a parent or guardian, look up the three types of levers and draw each one in the space's below. After you have drawn each lever, tell how it works and give an example of each type of lever.

CLASS 1 LEVER:

EXAMPLE:

CLASS 2 LEVER:

EXAMPLE:

CLASS 3 LEVER:

EXAMPLE:

PLAYGROUND FUN

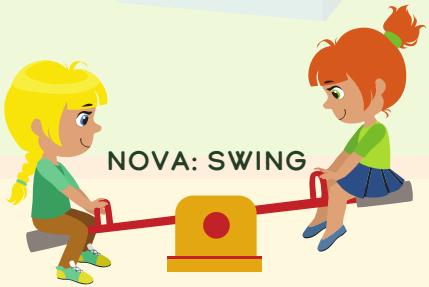
Have you ever wanted to design a playground feature for your friends and you to play at? Well now is your chance! Learn about levers below, then model or draw a new playground feature that uses a lever.

WHAT IS A LEVER?

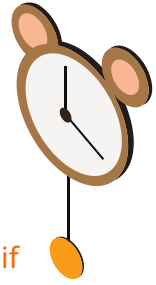
A lever is a simple machine that turns a small push or pull (a small force) into a larger (or stronger) push or pull (a larger force). A lever is made up of a platform, which is turned around a support (i.e., a fulcrum) – or other pivot point. Levers are a type of simple machine that help lift heavy loads – a seesaw is one fun example that is found at a park!

INSTRUCTIONS:

1. Gather clay, playdoh, Lego or other creative items
2. Design a playground feature that uses a lever
3. Test your lever and see if you can lift something with it!
4. Another way to design your new playground feature is to draw it on some paper.



BUILD A PENDULUM



Pendulums are made with a weight tied to the end of a long string or cable that can swing freely. A grandfather clock uses a pendulum to keep time.

MATERIALS:

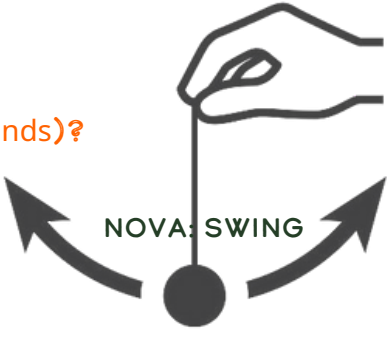
- String or Yarn
- A weight of some sort
- YoYo - Not Required, can be used as alternate to the String and Weight

INSTRUCTIONS:

1. Tie your weight to the string (skip this step if using a YoYo)
2. Let the string & weight hang in front of you and swing back and forth

CHALLENGES:

- Can you count how many times it swings in 1 minute (60seconds)?
- How can you use the above question tell time?
- What happens if you make the string shorter or longer?
- What if you add a lighter or heavier weight?



DID YOU KNOW:

In Taipei, Taiwan there is a building called Taipei 101 that has a giant pendulum in it. This pendulum is called the "Taipei 101 Mass Damper" and it weighs 66 metric tons! That's heavier than 300 Elephants! The Mass Damper swings around inside the building so that the building doesn't fall over in the wind!

WHAT IS INSIDE?

Have you ever taken something a part to figure out how it works? You may be fascinated to see how many different parts it takes to make some items work like they do.

INSTRUCTIONS:

- Find a pen that you have to click to write with
- Take apart the pen (with parent's permission)
- Ask yourself the questions below as you investigate how it works
- When you're done - can you put it back together and make it work?

QUESTIONS TO ASK AS YOU INVESTIGATE:

- How many parts of the pen are there?
- How many parts can you see on the outside?
- How many parts are inside to make it work?
- Are there springs?
- When you click the button to write, what makes the pen tip come out?

ASK YOUR PARENTS IF THEY HAVE OTHER THINGS YOU CAN TAKE APART!

Suggested items: Old Vcr, old computer, vacuum

NOVA: SWING

Cub Scout STEM Club

BOY SCOUTS OF AMERICA®
CASCADE PACIFIC COUNCIL

NOVA: SWING

BUILD A CATAPULT

REQUIRED MATERIALS

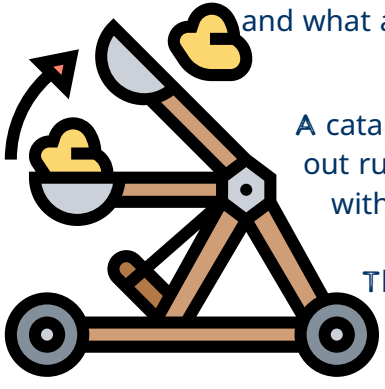
- Catapult Kit
- pom-poms or cotton balls

OPTIONAL MATERIALS

- Extra Rubber bands
- other objects to launch like crumpled paper, a ball of playdough, etc.

INSTRUCTIONS

1. Follow the instructions your parents receive via Email or on Facebook in the Cub Scout Advancement Academy to build your catapult.
2. Once built, you can use the catapult to launch pom-poms or cotton balls
3. Use different sized rubber bands and different launching objects
4. Graph your results and see what works well & what does not
5. Questions: what are some of the similarities between the things that flew far, and what are some similarities between the things that didn't go very far?



WHAT'S THE SCIENCE?

A catapult gets an object moving really fast using the energy stored in the stretched out rubber band- that's called "Motion". A Scientist named Isaac Newton came up with some laws about motion. The first half of the first law says that "an object in motion will stay in motion." That is why the pom-pom goes flying. The catapult got it going really fast, and it wants to keep going really fast, until something else stops it.

HOUSE OF CARDS

When engineers and architechts build houses, they have to be sure it will be able to support all the materials used in building - and whatever people will have their home.

INSTRUCTIONS:

Using only 1 deck of cards, try and build the tallest card house you can.
Test your design by seeing if it can hold any weight.
You can use the chart below to keep track of your design as you work through the engineering process!

ATTEMPT	# OF CARDS USED	HOW TALL?	DID IT HOLD THE OBJECT?
1ST HOUSE			
2ND HOUSE			
3RD HOUSE			
4TH HOUSE			
5TH HOUSE			

NOVA: SWING

BALLOON HOVERCRAFT

REQUIRED MATERIALS

- Balloon
- old CD (ask your parent's first!)
- Glue (hot glue is best, but not required)
- Lid or plastic cap (lid must be large enough to cover the center CD hole. The "pull up to open" dish soap lids work best, but a soda bottle cap with a hole drilled in the center also works)

INSTRUCTIONS

- Using your glue, glue your lid onto the center of the CD so that it completely covers the hole in the middle. Let that dry completely.
- Once dry, blow up your balloon & stretch the mouth of the balloon over the lid on your CD
- Now, place the cd on a flat surface & let the balloon deflate. It should be pushing all the air out through the lid.
- Next, watch your hovercraft come to life!

WHAT'S THE SCIENCE?

The air in the balloon is pushing the air out really hard as it deflates, and the only place the air can go is under the CD and out. This causes the CD to lift off the ground just a little tiny bit and float around. This is how hovercrafts work in real life.

NOVA: UP AND AWAY

STEM CLUB

DO OIL AND WATER MIX?

REQUIRED MATERIALS

- Water
- Vegetable Oil (or other oil)
- Food Coloring
- Beaker or clear glass
- Pipette

INSTRUCTIONS

Put a small amount of water in 3 different cups, and add a few drops of food color; place oil in a clear cup or small dish; Fill your pipettes with the colored water and slowly drop into the oil to create a design.

WHAT'S THE SCIENCE?

Oil and water do not mix because of the different ways they are formed. Water molecules are like magnets. they have a positive and negative end, and this makes them attracted to each other. Oil molecules do not have positive or negative ends, so they are not attracted to the water molecules. So, when water and oil are put together, the water molecules will be attracted to each other, and the oil molecules will group together too.

Did you know?

There are more molecules in a single glass of water than there are stars in the sky!

STEM CLUB

BOY SCOUTS OF AMERICA®
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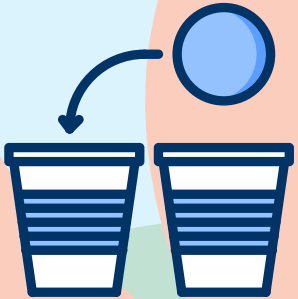
NOVA: Up & Away

TERMINAL VELOCITY

Have you ever put your hand out the window of a car when it is driving and felt the wind push against it? That push is called "wind resistance." Wind resistance happens when the air is not moving, but you are. The air pushes against you because it doesn't want to move. The faster you move, the harder the air pushes against you. If you are falling, at a certain point you will stop speeding up because the air is pushing against you just as hard as gravity is pulling you down. This is called "Terminal Velocity." Terminal velocity can happen in other things than air too.

INSTRUCTIONS:

- Get a clear plastic tube that is about 12" long (like a tennis ball tube) and fill it with clear corn syrup.
- Drop two round objects with the same diameter but different masses into the syrup (example: a steel ball and a glass marble).
- Use a stop watch to note when the two balls reach terminal velocity. Remember - that means when the object slows down.



Did both objects have the same terminal velocity? Does the mass of the object make a difference?

DID YOU KNOW?

Squirrels can survive a fall from any height, because they are able to spread their body out so much that their terminal velocity is low enough that they can land on the ground without hurting themselves.

STEM CLUB

BUILD A BOAT

Boats are amazing examples of engineering and the understanding of physics. Both things are very important in STEM. A boat floats by pushing water out from under it. The more water the boat can push out of the way, the more weight it can hold before it sinks. This is called buoyancy.

MATERIAL IDEAS:

- Recycled Items (be sure to clean well)
- Empty plastic food containers
- Empty milk jugs
- Empty water bottles
- Fruit or Vegetable?

INSTRUCTIONS:

Using recycled materials around your house, and with a parent's permission, build a boat. Once you have built your boat, see if it floats, and see how much weight you can put into your boat before it sinks. Try changing your design and seeing if you can make your boat hold more weight before it sinks. Think about some of the things that help make your boat float better. Try looking at some real boats and see if there are any similarities.

POST EXPERIMENT RESEARCH:
WHY ARE BOATS HOLLOW ON THE INSIDE?

NOVA: Up And Away

STEM CLUB JOKES

While there is no proof about the saying "Laughter is the best medicine."
The Cascade Pacific Council thinks everyone can use some more laughter.
Tell the jokes below to a friend and have fun laughing!

Why was six afraid of **SEVEN?**

Because Seven-Eight-Nine!

How did the astronaut serve dinner in **OUTER SPACE?**

On flying saucers!

Why shouldn't you trust **ATOMS?**

Because they make up everything!

Which sea creature is best at **GEOMETRY?**

Octo-Pi

What do clouds do when they become **RICH?**

They make it rain!

There are three kinds of people in the **WORLD**

Those can count, and those who cannot.

How do scientists freshen their **BREATH?**

With Experi-ments!

What should you do if no one laughs at your **SCIENCE JOKES?**

Keep trying until you get a reaction!

ICE FOSSILS

Have you ever wondered what makes ice melt the fastest? What about how you could make those ice cubes in that glass of water melt more slowly? Use common household items, along with the instructions below and make some predictions about what will work best!

SUPPLIES:

- 5-10 small plastic toys
- Plastic cups or ice cube trays
- Water
- Salt
- Dirt

OPTIONAL SUPPLIES

- Sand
- Rubbing Alcohol
- Another earth material
- Another liquid
- Pipettes to drop the liquid slowly

INSTRUCTIONS:

1. Place one toy in each plastic cup or ice cube tray
2. Fill with water and freeze for 24 hours (or until firm)
3. Set up your excavation site (do this outside). Your excavation site will have everything you need to free your toys from the ice. Place a small amount of salt, dirt, warm water, cool water and any optional supplies in individual cups at your site.
4. Once your toys are frozen, place the cubes onto a flat surface
5. Using small amounts of your excavation materials, begin sprinkling on the cubes

QUESTIONS TO ASK YOURSELF:

- What melts the ice the slowest and fastest?
- Do different combinations work better than another?

NOVA: UNCOVERING THE PAST

LIFE CYCLE OF A PLANT

GROW A PLANT FROM A SEED

MY PLANT: _____

All living things take time to grow. Humans, animals, and plants don't just join the earth fully grown. For this activity you will plant a seed and use space below to track its growth.

INSTRUCTIONS

After making our bottle garden, Write down the date on Day 1 (below). Track your seed, and write down new details every 7days. Is your seed full grown by Day 42, or does it need more time? You can even use a separate page to draw what it looks like every 7days!

DAY 1: _____

DAY 7: _____

DAY 14: _____

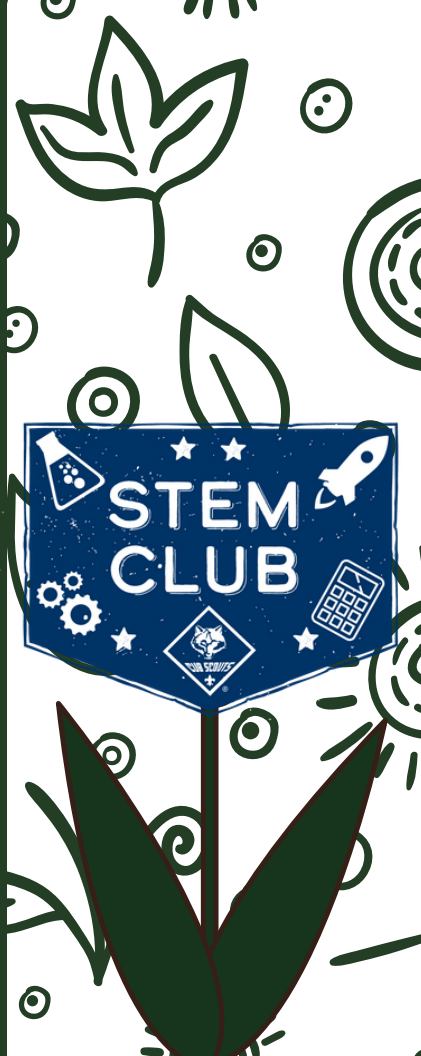
DAY 21: _____

DAY 28: _____

DAY 35: _____

DAY 42: _____

NOVA: WILD



FIND THE BIRDS

Just like humans, there are many unique and beautiful birds in the world. Depending where you live, the birds you find in your neighborhood might be a lot different than what you would see in the wild. Birds and animals all have their own specific habitat that they have adapted to.

INSTRUCTIONS:

With an adult, take a walk in your neighborhood, park, mountains, beach, or anywhere outdoors. Can you can spot 5 different types of birds. Use the note space & ask yourself things like:

- What does the bird sound like?
- Is it flying with a flock? (some bird friends)
- If you saw the nest - what did it look like?

NOVA: WILD/DOWN & DIRTY

BIRD 1 DESCRIPTION:

WHERE DID I SEE IT:

BIRD 2 DESCRIPTION:

WHERE DID I SEE IT:

BIRD 3 DESCRIPTION:

WHERE DID I SEE IT:

BIRD 4 DESCRIPTION:

WHERE DID I SEE IT:

BIRD 5 DESCRIPTION:

WHERE DID I SEE IT:

STEM CLUB

CHART THE TEMPERATURE

RECORD THE TEMPERATURE AT THE FOLLOWING TIMES. AN ADULT MAY HELP IF YOU ARE SLEEPING. WHAT DO YOU NOTICE ABOUT THE TEMPERATURE? DOES IT STAY THE SAME ALL DAY? TRY IT ANOTHER DAY AND MEASURE THE TEMPERATURE IN THE SHADE & DIRECT SUNLIGHT - DOES THAT MAKE A DIFFERENCE?

- 9am
- 12pm (Noon)
- 3pm
- 6pm
- 9pm

BOY SCOUTS OF AMERICA
CASCADE PACIFIC COUNCIL

NOVA: DOWN & DIRTY

CLOUD PREDICTIONS

The weather is always changing. The Earth's atmosphere (an atmosphere is a big layer of air that sits between the ground and space) is always moving and changing. That movement and change is weather. People have been using the clouds to predict the weather for centuries.

THREE TYPES OF CLOUDS:

STRATUS CLOUDS

Wide, flat, low & grey -They almost look like a big blanket in the sky. These could mean light rain. If they reach the ground, it can cause fog!

CUMULUS CLOUDS

Puffy like cotton balls with flat bottoms and means you can expect fair weather

CIRRUS CLOUDS

Wispy clouds, if they are increasing - look for rain within 24 hours

NOVA: DOWN & DIRTY

INSTRUCTIONS:

Chart the weather at your home every day for two weeks to see how it changes.
While you are charting the weather, look for clouds.
Can you see the different types of clouds? Are the predictions above correct?

DID YOU KNOW:

The Moon has almost no atmosphere,
so there is almost no weather on the Moon

STEM CLUB

BE A METEOROLOGIST

Sometimes when we think about nature, we think about plants or animals & forget that weather is a part of nature also! The neat thing about weather is that it can be studied anytime & anywhere.

TEST THESE PREDICTIONS:

- Halo around Sun or Moon in Summer- This usually means rain is coming
- Campfire - If smoke rises straight up - that tells us that barometric pressure is high and the weather should be good. However, if the smoke stays low to the ground - you may want to grab your raingear because the pressure is dropping and rain could be coming.
- What weather trends will you notice?

INSTRUCTIONS:

1. Grab a notebook and copy the design on this page
2. With a parents permission, watch the weather forecast on the news or read it in a newspaper
3. Write down the meteorologist's prediction for the next 10days
4. Begin tracking the weather and write down what it is like each day, in the second half of each rectangle
5. When you do this, you should also write your prediction for the next day.

DAY	NEWS PREDICTION		MY PREDICTION	
DAY 1				
DAY 2				
DAY 3				
DAY 4				
DAY 5				
DAY 6				
DAY 7				
DAY 8				
DAY 9				
DAY 10				

Was the meteorologist or you correct? Do you notice a weather trend? What did clouds in the sky tell you about the weather? Do fluffy white clouds mean the same thing as dark grey clouds?

AQUATIC ECOSYSTEMS

An Ecosystem is a biological community of interacting organisms and their physical environment. Your home is an example of an ecosystem. Your parents, siblings, pets, and you all live in the same place, forming a community. You all interact with each other, and the physical environment around you including your home, yard, and neighborhood.

INSTRUCTIONS:

1. With guidance from an adult, visit an aquatic ecosystem near your home. Examples include a stream, river, lake, pond, ocean, and wetland (a marsh or swamp)
2. Investigate the area and draw a picture or take a photo to remember what you have seen.

INVESTIGATOR QUESTIONS:

1. What are the most common types of plants growing there?
2. What animals did you see?
3. Did you see, hear, or smell any evidence of other animals? Your evidence might include things like bird calls, splashes of fish or frogs jumping, tracks, feathers, or bones.
4. How do aquatic ecosystems affect your life?
5. How have humans affected the ecosystem? Look for signs of humans such as trash and bridges or walkways.
6. How do you think humans have affected the ecosystem in ways you cannot see? Think about fertilizer and pesticides washing off your lawn and flowing into a stream. How would this affect creatures that live in the water?
7. What can you do to improve the quality of the ecosystem?

NOVA: DOWN & DIRTY

SECRET SPY CODE

YOUR MISSION

Scientists! Our Spy friends need our help decoding the message below! Can you help? Use the ASCII Table to decode the message below, then use the table to make your own secret message to give a friend! Find the number in the table to figure out what letter it should be.

SECRET CODE

72 101 108 108 111 32 87 111 114 108 100 33 32 83 84 69 77 32 105 115 32 65 87 69 83 79 77 69 33

SPY DECODER (ASCII TABLE)

WHERE IS THIS USED?

ASCII means American Standard Code for Information Interchange. ASCII uses numbers to represent text. All of the letters, numbers, and symbols in ASCII are called "characters" and each character has a specific number assigned to it. For example: a lowercase "a" is coded as "97", and the code "50" is for the number 7. When every character has its own code, it is really easy for a computer to store the information.

NOVA: CUB SCOUTS CAN CODE

Ascii	Char	Ascii	Char	Ascii	Char
32	Space	64	@	96	`
33	!	65	A	97	a
34	"	66	B	98	b
35	#	67	C	99	c
36	$	68	D	100	d
37	%	69	E	101	e
38	&	70	F	102	f
39	'	71	G	103	g
40	(	72	H	104	h
41	)	73	I	105	i
42	*	74	J	106	j
43	+	75	K	107	k
44	,	76	L	108	l
45	-	77	M	109	m
46	.	78	N	110	n
47	/	79	O	111	o
48	0	80	P	112	p
49	1	81	Q	113	q
50	2	82	R	114	r
51	3	83	S	115	s
52	4	84	T	116	t
53	5	85	U	117	u
54	6	86	V	118	v
55	7	87	W	119	w
56	8	88	X	120	x
57	9	89	Y	121	y
58	:	90	Z	122	z
59	;	91	[	123	{
60	<	92	\	124	|
61	=	93	]	125	}
62	>	94	^	126	~
63	?	95	_	127	Forward del.

SECRET SPY CODE

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Ascii	Char	Ascii	Char	Ascii	Char
32	Space	64	@	96	`
33	!	65	A	97	a
34	"	66	B	98	b
35	#	67	C	99	c
36	$	68	D	100	d
37	%	69	E	101	e
38	&	70	F	102	f
39	'	71	G	103	g
40	(	72	H	104	h
41	)	73	I	105	i
42	*	74	J	106	j
43	+	75	K	107	k
44	,	76	L	108	l
45	-	77	M	109	m
46	.	78	N	110	n
47	/	79	O	111	o
48	0	80	P	112	p
49	1	81	Q	113	q
50	2	82	R	114	r
51	3	83	S	115	s
52	4	84	T	116	t
53	5	85	U	117	u
54	6	86	V	118	v
55	7	87	W	119	w
56	8	88	X	120	x
57	9	89	Y	121	y
58	:	90	Z	122	z
59	;	91	[	123	{
60	<	92	\	124	|
61	=	93	]	125	}
62	>	94	^	126	~
63	?	95	_	127	Forward del.

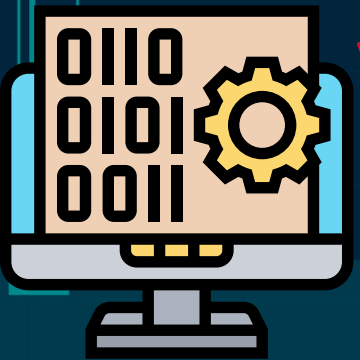
ADVANCED SPY CODE: BINARY

REQUIRED MATERIALS

- Pen
- 5 - 3x5 cards, or something similar

INSTRUCTIONS

Take your 5 cards and put a "0" on one side of each. Flip all of the cards over, and write a 1 on one card, a 2 on the next, a 4, on the next, an 8 on the next and a 16 on the last card. arrange the cards in order from largest to smallest, with the largest card on the left. Now, pick a number and find the cards that will add up to that number. For example: The number 5. 4 plus 1 equals 5, so leave the 4 and the 1 cards, and flip all of the others to 0, because they don't add to 5. In binary, if a number is not a "0" then it is represented with a "1" instead. This means that our code of 00401 would be represented as 00101 in binary. using this method, flip all of the cards back over so they show their numbers and try to count from 1 to 31 in binary. write down the code for each number.



WHAT'S THE SCIENCE?

Binary is computer language. A computer uses things like little tiny light switches to record information. A light switch can either be ON, or it can be OFF. just like a light switch, a computer can read a 0 (off) or a 1 (on). That's why a binary number 5 is 00101 instead of just the number 5.

Do you understand this binary Joke?: There are 10 types of people in this world... Those who understand binary, and those who don't.

ARE BATTERIES IMPORTANT?

Batteries are amazing. They make all sorts of awesome things available to people when they aren't near a power outlet. But how important are they? Do they power the world? All kinds of objects use batteries: Cars & Trucks, Robots, Flashlights, Remotes, what else can you find?

INSTRUCTIONS:

Go on a Battery Hunt at home, and with your parents around the neighborhood. Use the space below to write what types of batteries you see. Can you find different types of batteries? What do you think is the most important thing that is powered by a battery?

Batteries at Home

Batteries in my Neighborhood

STEM CLUB

NOVA: TECH TALK

DID YOU KNOW?

There is a battery-powered bell at Oxford University that has been continuously ringing for over 175 years. No one knows what the battery is composed of and no one wants to take the device apart in order to figure it out.

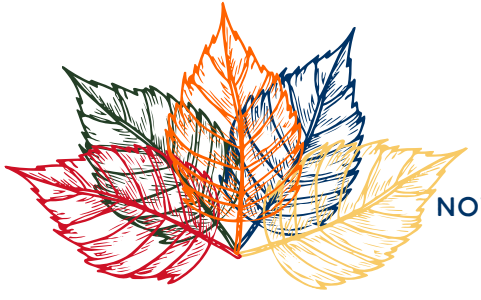
MAKE LEAF ART

REQUIRED MATERIALS:

- Leaves
- Paper
- Crayons or Colored Pencils

INSTRUCTIONS

1. Collect a variety of dry leaves from the ground
2. Place your leaf or leaves on a hard flat surface
3. Place your blank piece of paper on top of the leaves
4. Using a crayon or colored pencil, rub it across the paper where the leaves are.
5. You should start seeing all the small veins of the leaf - they will be darker than other parts of the rubbing. You might need to press harder if you don't see them.
6. What leaves are symmetrical? What art can you make if you layer leaves, or use different colors? The leaf below is the same one, turned five different ways with five different colors!

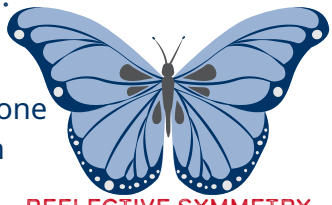


NOVA: FEARFUL SYMMETRY

STEM CLUB

SYMMETRY IN NATURE

There are many forms of symmetry, some of which you probably already know! Symmetry is defined as "a structure that allows an object to be divided into parts of an equal shape and size."



REFLECTIVE SYMMETRY

Some forms of symmetry include:

- Reflective Symmetry - Also called mirror symmetry, it is easy to notice because one half is a reflection of the other half. Butterflies are one example of this with each wing being the exact same shape and color combination.
- Radial Symmetry - This means that a cone or disk shape is symmetrical from a central axis. A starfish or tulip are two examples from nature.
- Bilateral Symmetry - the balanced distribution of duplicate shapes or parts within an organism. For example, many plants have the same amount of leaves on each side & are considered symmetrical - even though they wouldn't perfectly match if folded in half.

RADIAL SYMMETRY

BILATERAL SYMMETRY

INSTRUCTIONS

Take a hike (maybe even at Butte Creek Scout Ranch or Camp Clark), and see what symmetry you can find in nature! Bring a notepad to write down or draw what you find and share at the next STEM Club meeting!

STEM CLUB

NOVA: FEARFUL SYMMETRY

WATERMELON SEED SPITTING

Watermelon seed spitting contests can be found at many country fairs and events. The Guinness World Record was set in 1968 and is held by Lee Wheelis with a distance of 68 feet 9 inches. Can you beat that?!

INSTRUCTIONS

1. Get a delicious watermelon & have an adult help cut into slices.
2. Grab a family member or friend and list your names at the top of the chart.
3. Use a tape measurer to measure & create lines every 1ft to create a 'runway'
4. Enjoy your watermelon and save the seeds
5. One at a time, take turn spitting seeds down runway
6. Measure the distance each seed goes & keep track on the chart.
7. Find the average - Add all attempts and divide by 10 (you might need an adult help)
8. Who has the longest average?

NOVA: 1-2-3 GO

ATTEMPT			
1ST SEED			
2ND SEED			
3RD SEED			
4TH SEED			
5TH SEED			
6TH SEED			
7TH SEED			
8TH SEED			
9TH SEED			
10TH SEED			
ADD ALL ATTEMPTS			
DIVIDE BY 10			
AVERAGE DISTANCE SPIT			

HOW MUCH DO YOU WEIGH IN SPACE?

REQUIRED MATERIALS

- Weight Scale
- Calculator or Pencil/Paper

INSTRUCTIONS

Using your scale, figure out how much you weigh. After you know how much you weigh here on Earth, use the table provided on this page to figure out how much you weigh on some of the other planets in our solar system

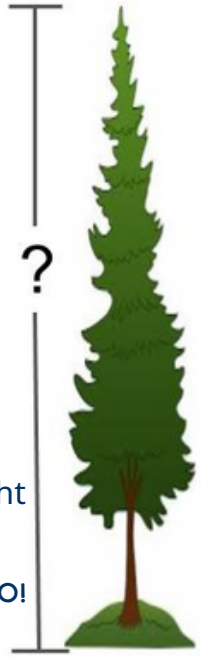
	Sun	Moon	Jupiter	Neptune	Mars
Your Earth Weight (in pounds)					
Multiply by:	x 27.97	x 0.166	X 2.36	x 1.12	x 0.377
Your Weight in Outer Space:					

MEASURING WITH SHADOWS

Do you know how tall your house is? Or that really tall tree in the park? People have been using shadows from the sun for many reasons for a long time. One example is a sundial, which uses a shadow to help tell time. One use of a shadow is for measuring things. Scientists and engineers can learn how tall something is by measuring how long it's shadow is, then comparing how long their shadow is next to it.

INSTRUCTIONS:

Use a tape measure or ruler to measure how long your shadow is. Is it the same size all the time? Is it longer in the morning, in the middle of the day, or the evening? Measure your shadow at each time & chart your results. For the easiest measuring, pick the time where your shadow is the shortest. At that time, measure the shadow of whatever you want to know the height of. Use the math equation on this page to find out how tall that object is.



EXAMPLE AND EQUATION:

A 6ft tall human, a tree with a shadow that measures 30feet, and the humans shadow is 3ft.
My equation is: 6x30÷3= 60 foot tall tree

(Your Height) x (Object Shadow Length) ÷ (Your Shadow Length) = Object Height

WHAT WILL YOU MEASURE WITH YOUR SHADOW?

NOVA: 1-2-3 GO!

MAKE YOUR OWN ICE CREAM

Ice Cream is a great summer time snack when it starts getting hot outside. But what happens if you don't have any ice cream in your freezer? Luckily, you can make it yourself at home!

REQUIRED MATERIALS

- 1/2 c. Cream (Milk or half and half will work)
- 1/2 TBSP. Vanilla
- 1 TBSP. Sugar
- Measuring cups
- Oven mitts or a towel
- 1 Large and 1 Small ziploc bag
- 1/2 C. Salt
- 5 C. Ice

INSTRUCTIONS:

- Pour Cream, Sugar and vanilla into small Ziploc bag and make sure it is fully sealed
- Pour ice and salt into large Ziploc bag
- Place the small bag into the large bag with the ice
- Pick up both bags with your oven mitts or gloves, and begin shaking the bags. Shake for 5-10 minutes. The cream will slowly thicken into ice cream. If you shake too long, you'll get butter. Shake too little, and you will have whipped cream. Take your ice cream out and enjoy!
- Try adding fresh fruit or crushed cookies on top as you enjoy your Ice Cream!

DID YOU KNOW?

Salt water freezes at a much colder temperature than fresh water. Adding salt to the ice makes it start to melt and causes a reaction. As ice melts, it sucks all the heat away from everything around it.
That's why the cream turns into ice cream!

STEM CLUB

AGE SURVEY ACTIVITY

Make a list of your family members and their ages.
Research the following graphs, then chart your data on a dot plot, histogram, and box plot.

Name:

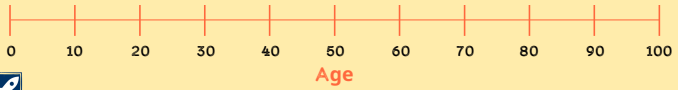
Date:

Age Data

Family Members	Ages
Family Member Name	Their Age

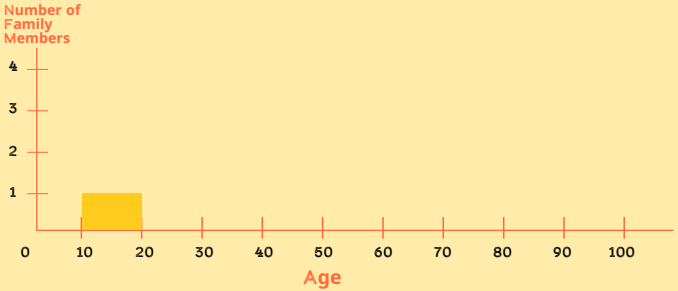
Dot Plot

Use a dot to represent each member of your family.
Move these dots into the dot plot below and add new dots if needed.



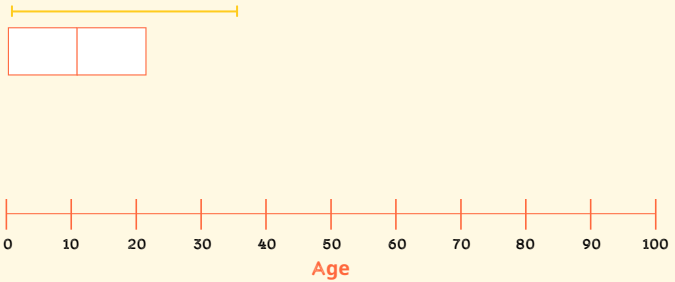
Histogram

Using your knowledge of histograms, use the yellow column below as a starting point. Create more columns as needed.



Box Plot

Using your knowledge of box plots, move and arrange the shape below to make a box plot that matches your age data.



BOY SCOUTS OF AMERICA
CASCADE PACIFIC COUNCIL

WATER SURFACE TENSION

REQUIRED MATERIALS

- Different sized coins
- Water
- pipette
- Magnifying card

INSTRUCTIONS

Using your Pipette, slowly add single drops of water to one of your coins. As you add each drop, use your magnifying card to see how the water is shaped on the coin. Do you notice anything interesting if you look from different angles about how the water sits on the coin? Chart how many drops you can put on the coin, then repeat with the other coins. Chart your results.

WHAT'S THE SCIENCE?

Water has something called "surface tension." Water molecules are attracted to each other like magnets. That means they try really hard to hold on to each other. That causes the surface molecules to hold onto each other really tightly, creating surface tension. Surface tension is how water striders (or water skippers) can walk on top of the water.

NOVA: SCIENCE EVERYWHERE

OOBLECK

REQUIRED MATERIALS

- Water
- Corn Starch
- measuring cup or beaker
- Spoon
- Bowl

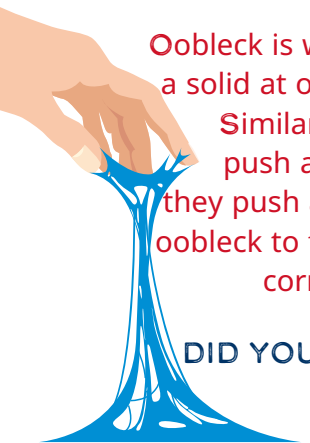
OPTIONAL MATERIALS

- food coloring

INSTRUCTIONS

Using your measuring cup or beaker, keep track of how much water and corn starch you are putting into your bowl. Start with a small amount of each, and experiment with what makes the best Oobleck.

WHAT IS OOBLECK?



Oobleck is what's called a "non-Newtonian Fluid" which means it acts like a liquid some times, and a solid at other times. This is because the individual pieces of corn starch are really tiny and light. Similar to how water molecules attract each other, the little grains of corn starch actually push away from each other (like when you put the same sides of two magnets together and they push away from each other.) The corn starch pushing away from itself makes it easy for the oobleck to flow around your hand slowly, but if you push on it really fast or punch it, you push the corn starch together, and cause a lor of friction, making the oobleck act like a solid

DID YOU KNOW: QUICKSAND IS ANOTHER EXAMPLE OF A NON-NEWTONIAN FLUID.

TAKE A WALK

Matter is any substance that has mass & takes up space by having volume. All matter can move from one phase to another. For example, water is a liquid, ice cubes are a solid & the steam from boiling water is a gas. What can you find as you get outdoors?

SOLID

example: Ice Cubes

LIQUID

example: Water

GAS

example: Steam

GENERAL STEM

Date: _____

ELEPHANT TOOTHPASTE

REQUIRED MATERIALS

- Clean plastic soda or water bottle
- 20-volume hydrogen peroxide (in beauty shops for dying hair)
- dry yeast
- warm water
- liquid dish soap
- food coloring
- small cup (or beaker)
- funnel
- safety goggles

INSTRUCTIONS

Pour 1/2 cup of hydrogen peroxide into the bottle. Add 10 drops of food coloring to the bottle. Add 1 tablespoon of soap to the bottle, and swish everything around a little to mix it up. Using your beaker or small cup, mix your water and yeast together. Mix it up really well for about 30 seconds, or until it almost looks like melted ice cream. Pour the water and yeast into the bottle and watch the science happen!

WHAT'S THE SCIENCE?

Hydrogen Peroxide has 2 hydrogen and 2 oxygen atoms in it, but one of those oxygen atoms wants break free and escape. Leaving you with plain water, and some oxygen. This usually takes a long time, but the yeast and warm water speeds it up a lot. The soap catches the oxygen as it escapes, turning it into foam.

NOVA: SCIENCE EVERYWHERE

RAINBOW CUP

REQUIRED MATERIALS

- Water
- Oil
- Food Coloring
- Rubbing Alcohol
- Karo Syrup
- Honey
- dish soap
- Beaker (you can measure!) or Tall Thin Glass
- Pipettes (to slowly add liquid)

INSTRUCTIONS

1. Add drops of food coloring to the liquids (use different colors!)
2. Slowly add each new liquid into the glass. Start with the honey, and allow it to settle at the bottom of the glass.
3. Using the pipette, slowly pour each of the other liquids into the glass by pouring them down the side of the glass.
4. For best results, pour the liquids in the following order: honey, syrup, dish soap, water, oil, rubbing alcohol. Allow the layers to settle.

LIQUID DENSITY - WHAT'S THAT?!

Liquids have different densities. Density is how many molecules of that thing are in a certain amount of space. The more dense an object is, the heavier it will be. The denser, heavier liquids will sink to the bottom of the cup, and the lighter, less dense ones will rise to the top.

Did you know: Liquid Mercury is so dense (13 times more dense than water) that an anvil or heavy lifting weights would float in it!

BOUNCING EGG

REQUIRED MATERIALS

- Raw Egg
- Vinegar
- large glass or jar
- Plate

OPTIONAL MATERIALS

- Food Coloring

INSTRUCTIONS

1. Carefully place your raw egg in your glass or jar.
2. Fill the jar with vinegar until the egg is completely covered
3. Cover the cup or jar with a lid.
4. Be Patient and wait for 24-72 hours (1-3 days) while the egg sits in the vinegar. If you see a lot of bubbles on the egg, don't take it out yet!
5. After 24-72 hours, remove your egg and carefully rinse it off in your sink. You should be able to wash off the shell of the egg completely.
6. Once this is done, you have your bouncy egg. Make sure you don't drop it from very high, and only play with it in the sink. It could still break open!

WHAT'S THE SCIENCE?

An egg shell has two main parts. The outside is the hard part of the egg that cracks when you drop it, or break it open for breakfast. Then there is the inside, which is soft and flexible. Vinegar is an acid, and it eats away the outside of the egg, leaving only the soft inside part.

NOVA: SCIENCE EVERYWHERE

STEM CLUB

BAKING SODA VOLCANO

REQUIRED MATERIALS

- Baking Soda
- Vinegar
- Beaker or Soda Bottle

OPTIONAL MATERIALS

- Balloon
- Funnel

INSTRUCTIONS

Pour your baking soda into your soda bottle, then pour vinegar into the bottle, and watch the science happen! You may choose to even build a volcano to place your 'vessel' in before the experiment!

For added fun, use less baking soda and vinegar in the same bottle so that it will not overflow when you mix them together. Pour the vinegar into the bottle, and the baking soda into your balloon, then put the balloon over the mouth of the bottle and allow the baking soda to pour in.

WHAT'S THE SCIENCE?

Vinegar and baking soda are what's called an "acid" and a "base". When an acid and base mix, something exciting happens - a reaction! In this case, the baking soda and vinegar mix together and make a lot of noise and bubbles filled with carbon dioxide. If you tried the extra experiment with the balloon, you probably have a balloon filled with carbon dioxide in it.

NOVA: SCIENCE EVERYWHERE/DOWN & DIRTY

BAKING SODA VOLCANO PT. 2

REQUIRED MATERIALS

- Settled Baking Soda & Vinegar Solution from Volcano
- Food Coloring
- Ice
- Baking sheet or outdoor surface

INSTRUCTIONS

1. Place the ice on an outdoor surface or baking sheet to catch the liquid.
2. Put a few drops of food color on the ice cubes (this will help you see the cracks as they form)
3. Spray the ice with the solution for a fizzy sound! You can also try pouring it slowly if you don't have a spray bottle.

WHAT'S THE SCIENCE?

Vinegar and baking soda are what's called an "acid" and a "base". When an acid and base mix, it causes a reaction. In this case, the baking soda and vinegar mixed together in the original volcano experiment gets reactivated with the ice. This is what causes the fizzy sound!

SINK OR FLOAT?

REQUIRED MATERIALS

- 5-10 items of your choice
- A Tub or Bucket to hold water

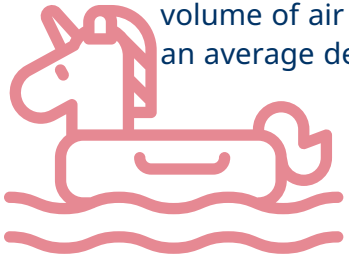
INSTRUCTIONS

Pick 5-10 objects and note your guess about if they will sink or float. You might be able to make a change to the object and try it a second time to see if it floats!

WHAT IS BUOYANCY?

Buoyancy (pronounced boy-en-cee), is a force on an object making that object rise or move upward. It comes from the Spanish word for "float", boyar. Buoyancy is made by the difference in pressure put on the object by the Fluid or air that the object is in.

An object with a higher density than the fluid has less buoyancy and will sink - like a pebble. A ship is made of steel which is more dense than water. It floats because it encloses a volume of air & the resulting shape has an average density less than water.



OBJECT	GUESS?	1ST TRY	2ND TRY

WATER MUSIC

BOY SCOUTS OF AMERICA
CASCADE PACIFIC COUNCIL

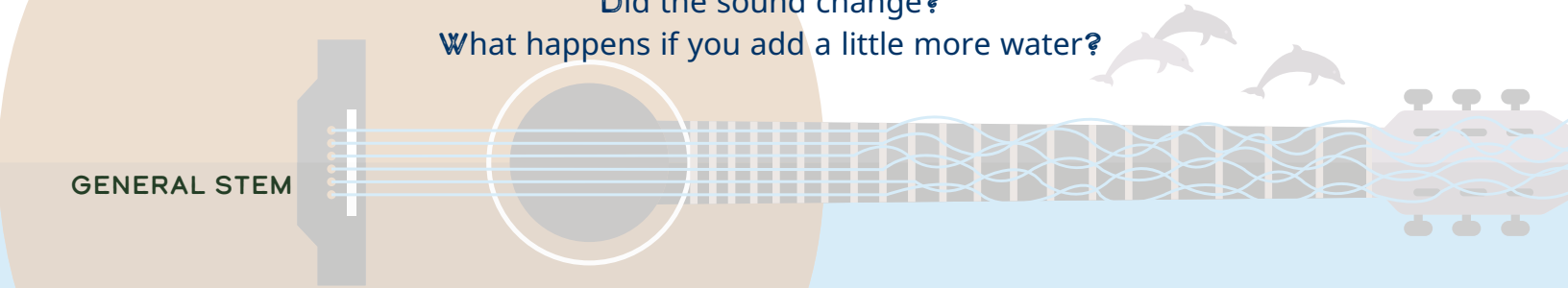
REQUIRED MATERIALS:

- Beaker or 3-5 Drinking Glasses
- Water
- Spoon or Pencil

DIRECTIONS:

- Fill the glasses with different amounts of water (You can also use your beaker, just add a little bit of water every few taps)
- Gently tap the glass with your pencil or spoon

Did the sound change?
What happens if you add a little more water?



Sound is made when something moves really fast and makes little waves in the air. Just like when you throw a rock in a pond and little ripples go out from where the rock went in the water. If you can change how fast something is vibrating, you can change how it sounds.

LEARN ABOUT A FAMOUS SCIENTIST

Scientists are a very important part of our world history. Guess what?! They all started out young and curious - just like you! Pick a book to learn some more about a famous scientist. Join the STEM Club Meetings for book recommendations!

BOOK SUGGESTIONS:	MY CHOSEN BOOK AND AUTHOR:	SCIENTIST THIS BOOK IS BASED ON:
WHAT WAS THEIR LIFE LIKE?	WHAT LIFE CHALLENGES DID THE PERSON FACE?	SCIENTIFIC DISCOVERIES:

NOVA: SCIENCE EVERYWHERE & SUPERNOVAS

COLOR CHANGING MILK

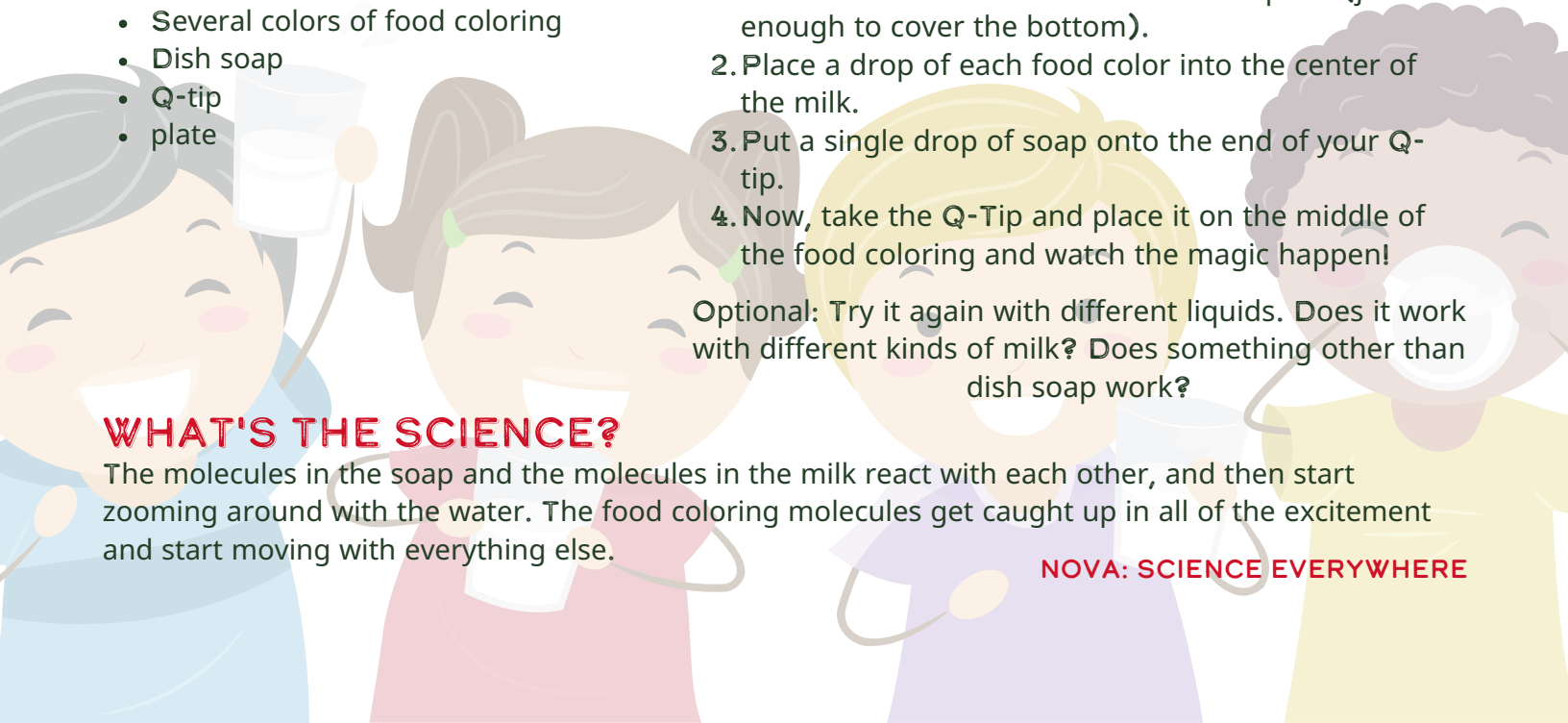
REQUIRED MATERIALS

- Milk (whole works best)
- Several colors of food coloring
- Dish soap
- Q-tip
- plate

INSTRUCTIONS

1. Pour a small amount of milk onto the plate (just enough to cover the bottom).
2. Place a drop of each food color into the center of the milk.
3. Put a single drop of soap onto the end of your Q-tip.
4. Now, take the Q-Tip and place it on the middle of the food coloring and watch the magic happen!

Optional: Try it again with different liquids. Does it work with different kinds of milk? Does something other than dish soap work?



WHAT'S THE SCIENCE?

The molecules in the soap and the molecules in the milk react with each other, and then start zooming around with the water. The food coloring molecules get caught up in all of the excitement and start moving with everything else.

NOVA: SCIENCE EVERYWHERE

GRAPH YOUR TOYS!

INSTRUCTIONS

Graphing is a part of Mathematics that help people see a set of data. The data shows us specific information. Depending on what information you are sharing, the graph can look many different ways. Use the following to create a Bar Graph of your toys! If you don't have any of the toy category listed - write 0 or pick a different category to use there. This chart goes up to 150, use the numbers on graph to help determine how high to color your bar.

START BY COUNTING EACH CATEGORY BELOW:

Lego: _____

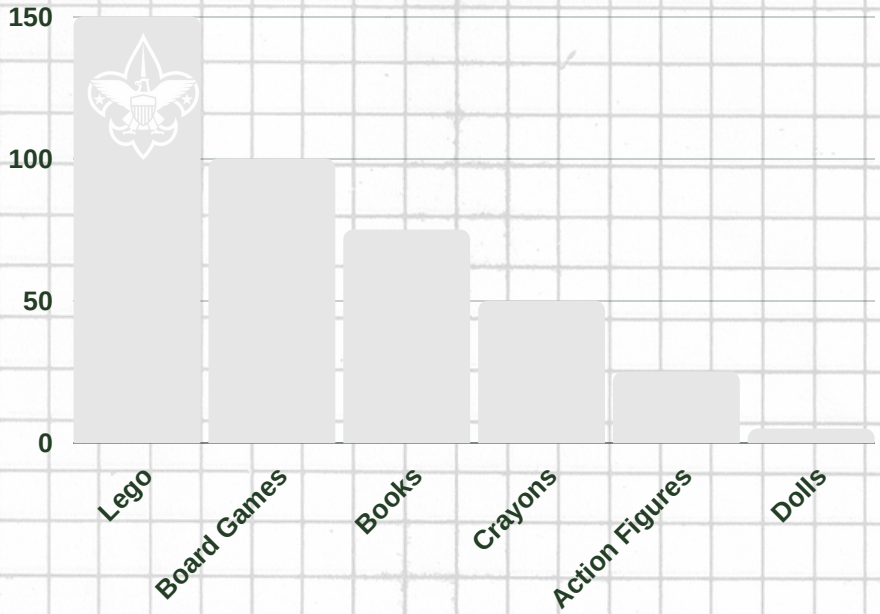
Board Games: _____

Books: _____

Crayons: _____

Action Figures: _____

Dolls: _____



LEAK PROOF BAG

REQUIRED MATERIALS

- Ziplock bag
- Water
- Pencils or Cooking Skewers

OPTIONAL MATERIALS

- Food Coloring

INSTRUCTIONS

- Fill a plastic bag with water (add food coloring to the water to make it a fun color if you want)
- Once bag is filled, hold it by one of the top corners, so it is hanging down below your hand.
- While doing this, use your pencils or cooking skewers and poke them all the way through both sides of the bag below the waterline. (Do this fast!)
- Do this as many times as you like in different spots on the bag using more pencils
- Does the water spill out? Did the bag pop? Why do you think this happened?

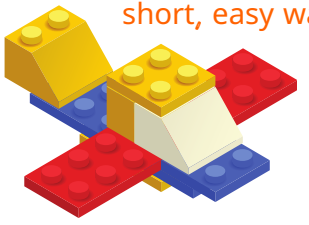
WHAT'S THE SCIENCE?

The Zip-lock bag is made of plastic. Plastic is made of something called a "Polymer." Polymers are long chains of molecules that are really strong and flexible. when you poke the pencil through the bag, the polymers hug around the pencil really tightly. So tightly that the water can't get out through the hole you made with the pencil!

GENERAL STEM

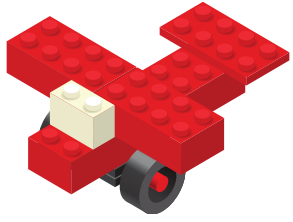
DESIGN A MINI-BUILD!

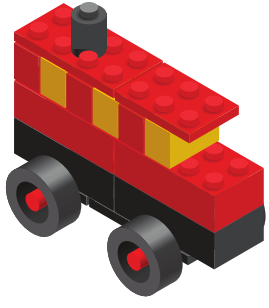
Many engineers in the world today got their start with designing by building with the classic Lego toys. Lego is easy to spend hours with designing and building. Lego mini builds are a short, easy way to play with the bricks. These mini builds all use less than 50 pieces!

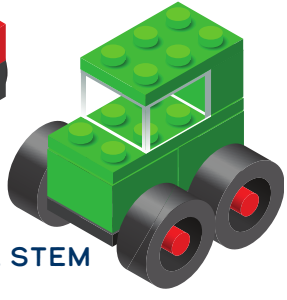


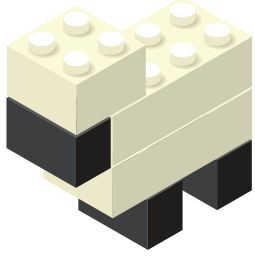
INSTRUCTIONS:

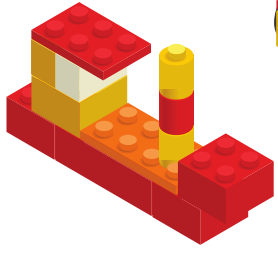
There are examples of Lego Mini Builds shown on this page. Can you recreate them?
Once you've tried that, think about something you could create in a mini-build and share your design at the next STEM Club meeting!

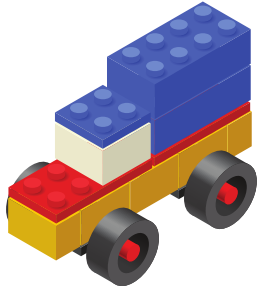












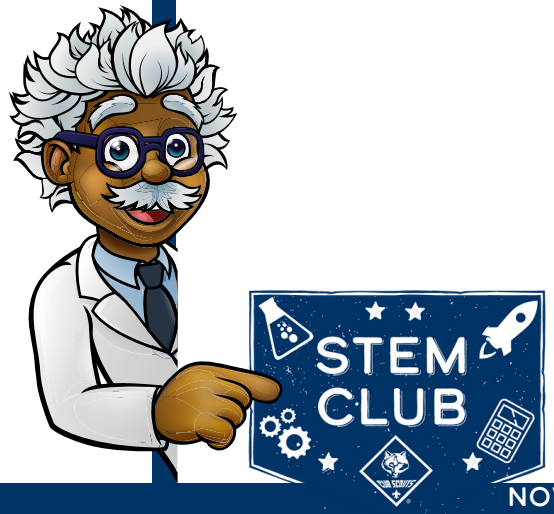
GENERAL STEM

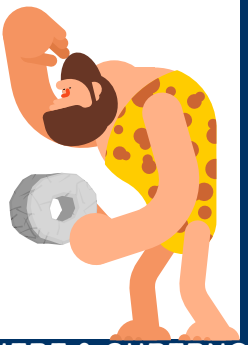
STEM CLUB

WHO INVENTED...

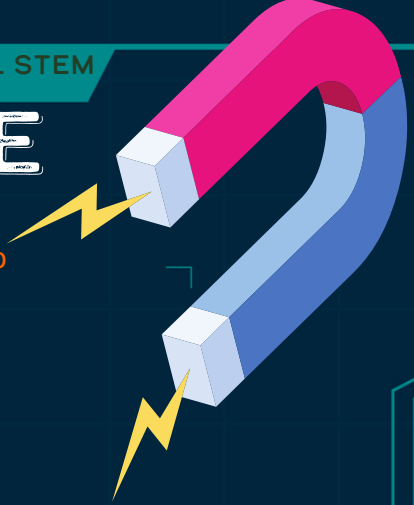
Have you ever wondered about the things you use every day? Inventors dream and bring to life real ideas each and every day. Pick something and learn about how it was invented!

ITEM TO RESEARCH:	INVENTED BY:	BEST KNOWN INVENTION:
BACKGROUND	INVENTIONS:	WHAT THEY TAUGHT ME





MAGNETIC SLIME



REQUIRED MATERIALS

- Black Iron Oxide Powder (from your STEM Club Box)
- Neodymium (Rare Earth) Magnet (From your STEM Club Box)
- Elmer's Glue
- 1/4 cup measuring cup
- 1 tablespoon
- spoons for stirring
- Bowl for mixing
- Liquid Starch

INSTRUCTIONS

1. In your bowl, mix together 1/4 cup of glue and 2 tablespoons of iron oxide powder
2. Add 1/8 cup of liquid starch and mix it really well - it will start to form slime immediately
3. After mixing the slime, knead it with your hands to finish forming
4. Wash your hands after kneading and experiment with your magnetic slime using the Rare Earth Magnets! What happens if you let the magnet sit on the slime for a few minutes?

WHAT'S THE SCIENCE?

The Iron Oxide powder is magnetically charged, and so are the neodymium magnets. When you add the iron oxide to the slime, it can't get our of the slime, so it pulls the slime with it as it tries to get to the magnet.

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CASCADE PACIFIC COUNCIL

WARNING: These are **VERY STRONG** magnets - do not place near any electronics or credit/debit cards!

IMPLODING SODA CAN

REQUIRED MATERIALS

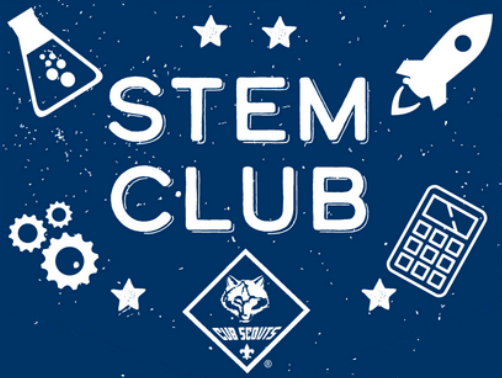
- Empty Soda can
- Bowl
- Cold Water
- pot or sauce pan
- Tongs

INSTRUCTIONS

1. With adult supervision, place about 2-3inches of water in a pot or sauce pan and heat on medium
2. Fill your bowl with cold water and set it aside
3. Fill your soda can with just a little bit of water and place the pop can in the hot water, with the top of the can out of the water.
4. Hold the soda can with the tongs, so it doesn't fall over. Once steam starts coming out of the top of the soda can, carefully take it out and quickly turn it upside down and dunk the end of the can with the hole into the cold water. What happened? Why do you think it happened?

WHAT'S THE SCIENCE?

When air gets hot, it expands and takes up more space. The hotter it gets, the more it expands. When you dunk the really hot can into the cold water, the air gets really cold really quickly, so it shrinks and takes up less space. This creates something called a "vacuum" that wants to suck more air in to fill the place where the hot air used to be. The water blocks the air from coming in, and the vacuum is so powerful that it sucks the sides of the can in. This is called an "implosion".



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