STEAMS DREAMERS

12 Month Patch Program





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steam dreamers October



Discover

Chemistry is the study of chemical elements, compounds and how matter is produced and how it changes. Our bodies and everyday items are made of chemical elements, compounds and matter. Chemistry is broken up into five different categories: Organic, analytical, physical, inorganic and biochemistry. Let's learn a little about each of the five branches of chemistry:

- Organic chemistry is the study of carbon-based compounds. These can be found in cleaners, plastics and medicine. An organic chemist works in a lab, creating better products for the environment and safer medicines.
- Analytical chemistry tests to determine ingredients in a substance. For example, someone who works at a pool often tests the water to see if there is too much or too little chlorine, while a nutritionist studies food to learn about its nutrients.
- Physical chemistry is the study of molecules and how they move or change. For example, when you bake a cake, it changes from a liquid to a solid, which is a physical reaction.
 - Inorganic chemistry is the study of non-living things, like rocks or metals. Inorganic chemists may study rock formations and try to determine how they were made or study the strength of a metal beam.
- Biochemistry is the study of the chemistry in our bodies. Biochemists may study cancer cells or viruses to learn more about the disease and its treatment.

steam dreamers October



Alice Ball was born on July 24, 1892 in Seattle, Washington. Alice had two older brothers and a younger sister. Her father was a newspaper editor, photographer and a lawyer. She went to Seattle High School, where she received top grades in sciences and graduated in 1910. Alice studied chemistry at the University of Washington and earned a bachelor's degree in pharmaceutical chemistry. Two years later, she earned another degree in pharmacy. Along with her pharmacy instructor, she published a 10-page article in the Journal of American Chemical Society titled "Benzoylations in Ether Solution." This was a rare accomplishment - not only for an African American woman, but for a woman of any race.

After she graduated with a degree in pharmacy, Alice was offered many scholarships from top schools, such as the University of California, Berkeley and the University of Hawaii. She decided to move to Hawaii and pursue a master's in chemistry. While there, she studied chaulmoogra oil and its healing properties. Chaulmoogra oil was used for leprosy, but Alice was able to make it injectable. Leprosy is a disease that causes skin sores and nerve damage in your body. She changed the structure of the oil so it could dissolve in the bloodstream. This treatment was used until the 1940s. This technique was known as the "Ball Method," which was the only treatment for leprosy. Unfortunately, she was unable to publish her work because she died at the age of 24 on December 31, 1916. Another chemist continued her work. He published Alice's work and produced large quantities of the chaulmoogra extract. Sadly, he did not give any credit to Alice, renaming it the "Dean Method."

Alice's work directly affected 8,000 people diagnosed with leprosy. Because of her, patients were no longer isolated and could be treated at home. The university did not recognize her work for nearly 90 years. In 2000, they finally honored her by putting a plaque on the school's only chaulmoogra tree. On that same day, the former governor of Hawaii declared February 29 as "Alice Ball Day," which is now celebrated every four years. In 2007, she received a Medal of Distinction and the school placed another plaque on the tree to honor her. In 2016, a Hawaiian magazine recognized Alice as one of the most influential women in Hawaiian history.

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Chemistry

STEAM DREAMERS October





'ake Action

Practice your physical chemistry skills by making slime. Try the recipe below or use your own!

 Food coloring 	• ¼ cup of liquid starch
	Food coloring

Pour glue into a bowl. Add food coloring and stir until mixed. Add liquid starch. Stir or mix until combined or until it is no longer sticky.

7 Try this	eggshell experiment! Record	l your results
and shar	e with your friends.	
Supplies:		
• Orange juic	e 🔹 White wine vinegar	• Water
 4 eggs 	 Pencil and notebook 	 Paper towels

- Cola soda • 2-4 clear glasses

Directions:

Place an egg in each glass. In one glass, you will pour the water (this is your control substance). In another glass, pour the vinegar. If you have all four glasses, put the soda in one and the juice in the other. Let the eggs sit in the liquids for a few hours. Remember to keep an eye on them and record your findings. Let the eggs sit for at least 24 hours.

Complete this penny-cleaning experiment with your 3 friends or family. First, lets talk about why pennies change colors. Pennies are made of copper, and when copper is exposed to oxygen, it will start to corrode because of chemical reactions. The coating is called patina, which are molecules that actually are created to protect the metal underneath. Supplies:

ouppileo.		
Mustard	 Dish soap 	 7 clear plastic cups
• White vinegar	 Lime juice 	 7 corroded pennies
• Water	• Salt	• Ketchup
Discution		

Directions:

Place a penny in each cup. Pour a little bit of each of the kitchen items over the pennies. Let sit for 30 minutes. Pull each penny out, wipe them off and compare which kitchen item made the pennies the most clean and shiny.

Did you know you could make plastic out of milk and vinegar? 4 Try this experiment and share your creation with your friends! A little bit of science on how milk can turn into plastic: Milk contains a protein called casein. During this experiment, a reaction between the warm milk and the vinegar (which is an acid) causes the casein

Complete four of the following:

molecules to form chains called a polymer. The polymer can then be molded and shaped, which makes it a plastic. In this experiment, it also can be known as casein plastic or milk plastic. Supplies:

•	A stove top or microwave	 Bowl
	(with the help of an adult)	 Spoon
٠	Milk (2% or lower fat content)	• Strainer
٠	White vinegar	• Paper towels
Dii	rections.	

Heat up one cup of milk (bring to a steam, not a boil). Remove the milk from heat and add four teaspoons of vinegar. Stir slowly. You will notice the mixture will start to curdle or get chunky. Mix this for a minute. Strain the mixture and let it drip for a few minutes. Pour the curds on a paper towel, then carefully pat and remove the extra liquid. You will notice that it is kind of crumbly, but you should be able to squish and shape it.

Perform a scratch test to determine the hardness and the 5 properties of rocks and minerals. Do this activity with your friends and family.

Supplies.	
Rocks	Magnifying glass (optional)
Nails of various sizes	Black and white construction paper
Directions:	

First, start by scratching the rocks on the construction paper. You will want to make two different piles. Rocks that leave colored marks on the paper and rocks that do not. Next, with the help from an adult, use nails to attempt to make a mark on the rocks. You will notice one of two things:

1. The rock will scratch, leaving a line, a crack or dust.

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2. The nail will rub off on the rock, leaving a silver mark on the rock. If you see Number 1, this means the nail is harder than your rock. If you see Number 2, this means the rock is harder than the nail.

Visit a chemistry lab at a local college or university. Speak with a chemistry professor during the visit.

Take a virtual field trip with NOVA Education in their series Beyond the Elements at https://bit.ly/BeyondTheElements.

Think of something you care about or have a passion for, and 8 then write an article about it.



Discover

Computer programming is the process of designing and building a list of instructions to tell a computer to do a specific thing or task. Computers are everywhere, and programming is a good skill to have. Computer programmers, also known as "coders," sometimes use different programming languages to communicate with computers. Let's discover some of the different programming platforms that are free to use:

- Scratch 3.0 This was created by students at Massachusetts Institute of Technology for youth who are between the ages of 6 and 16. It has code blocks to choose from, instead of actually typing code. Using this program, you access different stories or games and create your own projects. This program not only allows you to code, but you can also complete activities and lessons.
- Blockly.Games This program uses blocks to practice coding. You place the blocks in the order you want your program to run. You can play games and participate in other fun activities to keep yourself interested.
- Hour of Code with Code.org This program uses blocks to practice coding. There are many different programs and activities to choose from.
 While going through each of these programs and activities, you will notice that there are videos to help you along the way.

STEAM DREAMERS

November



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Connect

STEAM DREAMERS

Mary Allen Wilkes was born on September 25, 1937 in Chicago, Illinois. She graduated from Wellesley College in 1959 with majors in philosophy and theology. Mary went to college to become a lawyer, but faced many gender barriers in the legal field. She ended up working as one of the first female computer programmers. However, she never lost her passion for the law and finally became a lawyer in 1975.

From 1959 to 1960, Mary worked at Massachusetts Institute of Technology's Lincoln Laboratory on the Speech Recognition Project through the Digital Computer Group. In 1961, the group started to work on the Laboratory Instrument Computer (LINC), which is considered to be one of the first mini computers. Mary designed the console prototype for LINC and wrote the manual for the final design. In January 1963, the LINC group left the Lincoln Library and formed the Center for Computer Technology at Massachusetts Institute of Technology's other campus. Mary served as an educator and worked on writing the assembly programs for the 1024-word LINC. She was also a co-author for LINC's programming manual, Programming the LINC.

In the summer of 1964, a group from LINC's development team left Massachusetts Institute of Technology to form the Computer Systems Laboratory at Washington University in St. Louis, Missouri. Mary did not immediately join the team. She worked at home in Baltimore, Maryland. In fact, she is considered to be the first person to use a personal computer in the home due to LINC's increased computer memory.

Mary left the computer field in 1972 and attended Harvard Law School. She worked as a trial lawyer, both in

private practice and as the head of **Economic Crime and Consumer** Protection Division in Middlesex County in Massachusetts. She also taught a Trial Advocacy Program at Harvard from 1983 to 2011. In 2001, she became a judge, sitting mainly on cases involving computer science and information technology. In 2013, her work was recognized in the Great Britain's National Museum of Computing's exhibit "Heroines of Computing."



STEAM DREAMERS November



Take Action

Complete four of the following:

- Sign up to create your free Scratch account at https://scratch.mit.edu/join! Do at least two 1 activities with Scratch. Share what you create with you friends and family. Complete an Hour of Code program on Code.org at https://code.org/hourofcode/overview. Share 2 your completed programs with your Girl Scout sisters. Let's make a binary code bracelet. Spell out your name and make one for your friend! To complete 3 this activity, you will need: • Binary Code Alphabet Sheet (https://www.convertbinary.com/alphabet) • 3 different colored beads (enough of two of the color each to spell your name; the other color is a space bead) String Spell your name on a piece of paper. Use the Binary Code Alphabet Sheet to write out your name in binary code. Choose one bead color to be "0," one bead color to be "1" and the last color to be your space bead. Make a knot in the string to start your bracelet. Start putting your beads on your bracelet. Create a maze. You can make one made with Legos, in the outdoors or draw your own. Write out 4 the directions to make it through. For some help creating your maze, visit https://bit.ly/MazeActivities. Let your friends try the maze to see if they can figure it out. 5 Work on earning your coding badges. 1 Visit a computer lab and design an item for a 3D printer. 6 Invite a female coder to speak with your troop. <HTML: 7 BODV HEADED
- Create your own app. Use https://bit.ly/AppActivity to help 8 you along the way.



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Discover

STEAM DREAMERS

December

Civil engineering is the designing and building of large structures, such as bridges, dams and tunnels. Civil engineers also work on water and sewage plants, and they even build houses. They also help with maintenance and tearing down structures safely. Furthermore, civil engineers have a role in transportation, assisting with the creation and upkeep of roads and railroads. To work as a civil engineer, it requires training and/or studying at a college. If you want to be a construction worker, you have to complete job training or have an apprenticeship. To design structures, you need a college degree.

Civil engineering has different areas of focus. Let's discover a few:

- Structure Structural engineers deal with the design of the structure to make sure it can withstand both gravity and wind. They must make sure all the buildings and/or structures are up to code.
- Geotechnical Geotechnical engineers work with the performance of earth materials when building. They study the conditions of soil, rock and groundwater, and then analyze how these materials will react when building structures.

A civil engineer may need to know both areas of focus, as some jobs involve a combination of the two.

steam dreamers December



Connect

Emily Warren Roebling was born September 23, 1843 in Cold Spring, New York. Her father was a state assemblyman and a town supervisor, and her older brother was a corps commander in the Union Army during the American Civil War. Emily went to a convent school in Washington, D.C. Later on, she met Washington Roebling, an engineering officer on her brother's staff. They got married in 1865, and two years later, they had a son named John Augustus Roebling II.

In 1867, Emily and her husband traveled to Europe so he could study techniques for constructing foundations underwater. Emily's husband took control over the construction of the Brooklyn Bridge project after the death of John Augustus. While her husband worked on the bridge, he was exposed to continued underwater pressure. This caused him to suffer from decompression sickness, a condition in which nitrogen gas bubbles form in the bloodstream and can release if a person moves from high pressure to low pressure too quickly. By 1872, he was unable to care for himself, so Emily became his main caregiver. She also began to work with the engineering team on the Brooklyn Bridge project. Just before the bridge opened in May 1883, Emily rode the first carriage to cross the bridge while carrying a rooster, which symbolized victory.

steam dreamers December



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Take Action

Complete four of the following:

	Build	a gumdr	op geosc	ience	dome
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Supplies:

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- Gumdrops
- Toothpicks

Directions:

Geodesic domes are sphere-like structures made up of interconnected triangles. Attach five toothpicks together, using the gumdrops to form a flat pentagon. Put two more toothpicks in each gumdrop, pointing upwards. Take five gumdrops and attach them to the new toothpicks, putting two toothpicks into each gumdrop to form triangles. You should have five triangles. Put toothpicks in between each gumdrop, making another pentagon shape at the top. Then, take five toothpicks and put one into each of the gumdrops, pointing to one direction. Connect them all with one more gumdrop.

Build a bridge.

Supplies:

• Any household objects and materials you can find

Directions:

Your objective is to create a sturdy bridge that is big enough to hold a small book. You can do research on the internet for tips on how to build your bridge. Share photos of your bridge with your friends and sister Girl Scouts.

Create structures using marshmallows and toothpicks. Do this activity with your friends or family. See who can create the best and most creative structure.

- 4 Visit a local bridge in your area. Learn the history of the bridge.
- 5 Invite a civil engineer to come and speak with your troop.
- 6 Take a virtual tour of America's landmark bridges, such as the Golden Gate Bridge.
 - Host a bridge building contest with your friends or Girl Scout sisters. See who can build the best bridge.

Watch this video and see what makes bridges so strong! https://bit.ly/WhatMakesBridgesStrong

steam dreamers January



Painting is the art of making pictures using colors, shapes, lines and textures. People of all ages can paint using different techniques and materials. Paintings are commonly created on paper or canvas, but new formats are being created and shared all the time. Museums and art galleries showcase paintings of professional or historical artists. Painting has been around for thousands of years. The record of the first painting was found on walls of caves. Let's discover some of the painting art styles:

- Realism The painting looks just like the real thing, with no added textures or styles.
- Abstract This style is actually a few of them combined, and it may even have no meaning. It usually doesn't contain any recognizable objects or people.
- Expressionism This style is meant to show the artists emotions. The work can encompass places, people or just random colors, depending on what the artist wishes to express.



Painting

steam dreamers January



Georgia O'Keeffe was born on November 15, 1887. She was the second of seven children. When Georgia graduated from high school in 1905, she was determined to become an artist. She attended the Art Institute of Chicago and the Art Students League in New York to learn techniques of traditional painting. After studying with Arthur Dow, her artistic practice changed. She altered the way she thought about art, inspiring her to experiment with the abstract style. She created a series of abstract charcoal drawings, which she used to better express her feelings and ideas. Georgia mailed some of these abstract drawings to a friend in New York, who showed them to Alfred Stieglitz. Alfred was an art dealer and renowned photographer. He was the first to exhibit her work in 1916.

By the 1920s, Georgia was recognized as one of America's most important and successful artists. She was known for her paintings of New York's skyscrapers and flowers. In the summer of 1929, Georgia began taking trips to New Mexico. The landscape and local cultures inspired Georgia to be more creative with her paintings. For the next two decades, she spent most of her summers living and working in New Mexico. By 1949, she had moved to New Mexico for good.

In the 1950s, Georgia travelled overseas, where she painted and sketched the spectacular places she visited.

This included the mountain peaks of Peru and Japan's Mount Fuji. At the age of 73, she painted aerial views of clouds and sky. She started to suffer from macular degeneration – which means that her vision was failing, causing blindness and blurry vision. She completed her last unassisted painting in 1972. In 1977, at age 90, she said, "I can see what I want to paint. The thing that makes you want to create is still there." Late in life and almost blind, she had several assistants to help her continue her work. She created these works using her memory and vivid imagination. Georgia died on March 6, 1986 in Santa Fe, New Mexico at the age of 98. The Georgia O'Keeffe Museum's collections include about 150 paintings. There are also hundreds of her works on paper, which include her pencil, charcoal drawings, pastels and watercolors. Some of her personal property, such as dresses and paintbrushes, are in the museum, as well.



Painting

STEAM DREAMERS





Take Action

Complete four of the following:

- 1 Create a self portrait. Share it with your friends and family.
- 2 Create abstract art using paint and a straw. Dip the straw into the paint. Blow into the straw. Blowing into the straw causes the paint to spray onto the paper, creating an abstract work of art.
- 3 Paint a picture on a day you are feeling emotional. You could be happy, sad or mad. Let your emotions shine through as you create your masterpiece.
- 4 Create a painting with a story behind it. Share your painting with your friends and family.
- 5 Visit a local gallery or museum.
- 6 Learn how to make paint from items found in nature. Here is a link to ideas on how to create your paint: https://bit.ly/NaturePaint.
- 7 Paint an outside landscape of your choice.
- 8 Create an abstract drawing. Share it with your friends or family

steam dreamers February





• Algebra - Uses equations to solve for a specific variable or thing. An example of an algebraic equation is:

3 + 2x = 15 (subtract 3 from each side) 2x = 12 (Divide each side by 2) X = 6

- Geometry Helps you determine the measurements of shapes. Geometry is used to build houses and bridges. It allows builders to determine necessary lengths and sizes to complete a structure.
- Statistics Involves collecting data or information, summarizing and determining what it means or tells. This can be used to predict things like sports results and weather.

Mathematics

steam dreamers *February*



Connect

Dorothy Vaughn was born on September 20, 1910 in Missouri. Her family moved to Morgantown, West Virginia, where she attended Beechurst High School. She graduated in 1925 and was valedictorian of her class. As a high schooler, Dorothy was a hard worker and received a scholarship from West Virginia Conference of the A.M.E. Sunday School Convention to attend Wilberforce University in Ohio. At the university, she became a member of the Alpha Kappa Alpha sorority. In 1929, she graduated with a bachelor's degree in mathematics.

In 1932, she married Howard Vaughan and moved to Newport News, Virginia. They had six children - two girls and four boys. During the Great Depression, Dorothy worked at Robert Russa Moton High School as a math teacher. Later, she was hired to work for the National Advisory Committee for Aeronautics (NACA) and assigned to the West Area Computing. This was a segregated unit for African American women. They were segregated due to the Jim Crow laws, which prevented African Americans from working directly with their white coworkers. This law also required the use of separate bathrooms and dining facilities. Dorothy worked with many brilliant women who could complete complex math calculations by hand. In 1943, Dorothy began her career as a mathematician and programmer at Langley Research Center, where she specialized in flight path calculations and computer programming.

In 1949, Dorothy was assigned as the temporary head of the West Area Computers and became the first African American supervisor at NACA. She served in this temporary position for a few years, but eventually became the permanent supervisor. Dorothy knew computers were going to be the future, so she taught other women in her group to program. She wanted them to be prepared for the future.

In 1958, NACA became National Aeronautics and Space Administration (NASA), and the segregated facilities were disbanded. In 1961, NASA introduced the first digital computer to the Center. Dorothy was moved to the digital computer center and taught herself Fortran, a computer language. During this time, she continued to contribute to the space program by working on the Scout Launch Vehicle Program.

Dorothy worked at NASA-Langley for 28 years and retired in 1971 at the age of 61. In an interview in 1994, Dorothy said that working at Langley during the Space Race felt like being on "the cutting edge of something very exciting." She was open about her experience as an African American woman during that time. She said, "I changed what I could, and what I couldn't, I endured." Dorothy died on November 10, 2008 at the age of 98.

In 2019, Dorothy was awarded the Congressional Gold Medal and a crater on the moon was named in her honor. It is known as the Vaughan Crater. On November 6, 2006, a satellite named Dorothy was launched in her honor.

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steam dreamers February



Take Action

Complete four of the following:

1	Play a game of dice wars! Grab a friend or family member and a few sets of dice and play! Instructions:
	• Each player has at least two dice.
	• Each player rolls their dice and whoever has the highest or lowest number gets a point. You can
	customize this game to play however you want!
2	Compete with your friends in a "minute math" quiz. Have an adult come up with a bunch of simple math questions. Have the adult time you and your friends to see who can solve the most questions in one minute.
0	Draw a math facts garden outside! Take some sidewalk chalk and draw a large flower with a
3	circle in the middle, surrounded by 10 petals. On the outside of each petal, number them one
	through 10. Pick a number to put in the center of your flower. Now, do the math Multiply the
	middle number by the numbers on the outside of the petals and write the answer in the petal.
	Do a few of these and share them with your friends!
4	Math is important in sports. With your family or troop, observe a live-action game. This can be any sport that interests you.
5	Math is used to build structures. Visit a historic building in your state or town.
6	Build teams and have a math field day with your troop. Keep score and follow the math.
7	With your troop or as an individual, select a new recipe for baking.
	With a responsible adult, follow the instructions. Identify how
	math is being used in the process.
0	Dorothy taught other women the skills she knew so that they could
8	succeed. Teach someone something you know that they don't. Or.
	help them get better at a skill they do know.

16 🗖

steam dreamers



17 🔍

Discover

Astronomy is the study of space and everything in it - planets, stars, galaxies and much more! It's considered one of the oldest sciences in the world. People who study astronomy are called astronomers. Many astronomers study space using telescopes, while some study items collected from space. Thousands of years ago, before clocks were invented, people told time by watching the sun and stars. These people are known as the first astronomers. Let's discover more components of space:

- Planets: There are eight planets, including Earth, Jupiter, Venus, Mars, Saturn, Neptune, Uranus and Mercury. All of these planets orbit around the sun. Most astronomers believe there are two parts of the solar system: inner and outer. The inner portion consists of planets closer to the sun, like Mercury, Venus, Mars and Earth. On the other hand, the outer portion contains the rest of the planets. Location is determined by the distance between the specific planet and the sun.
- Stars: There are many different types of stars, often categorized by color. Small stars are red and don't glow as much; medium stars, like the sun, are yellow; and large stars are super bright. Their brightness depends on their heat.
- Galaxies: Galaxies are made up of stars and other things floating around in space. Containing trillions of stars, galaxies are typically massive in size. The stars tend to spin around the center of high gravity sort of like the way the planets orbit around the sun. Scientists believe there are billions of galaxies in space. One of the most common galaxies is the Milky Way, which is believed to be made of more than 300 billion stars.

 Comets: Made up of dust and ice, comets orbit around the sun. They're sometimes described as a "dirty snowball." There are billions of comets in space, but most never come close to passing Earth. Halley's Comet, the most common comet, passes by Earth about every 76 years.

steam dreamers



Maria Winkelmann was born on February 25, 1670 in Germany. She was educated by her father, and after his death, her uncle continued to tutor her. Maria's interest in astronomy grew, leading her to become a student of Christoph Arnold, who was a self-taught astronomer and farmer. Through this connection, she met Gottfried Kirch, who she married in 1692. With the help of his sisters, Gottfried produced calendars that contained information regarding phases of the moon and times of sunrises and sunsets. After their marriage, Maria assisted with the calendars.

In 1700, Maria and her husband worked at a private observatory for Bernhard Friedrich Baron von Krosigk, who was an amateur astronomer. Maria and her husband took turns observing the sky. In 1702, Maria discovered a new comet. However, her husband claimed it as his discovery and did not admit the truth until 1710. In 1707, Maria published her observations of the Aurora Borealis (northern lights). Later, in 1709, she wrote that the sun, Saturn and Venus would pass each other.

In 1710, Maria's husband passed away. Maria asked the Royal Berlin Academy of Sciences if she and her son could continue producing calendars. She had been doing the required work, since her husband became ill. The Academy's president supported Maria's request, but everyone else disagreed. They didn't want a woman producing the calendars.

In 1712, when the von Krosigk observatory opened, Maria moved there permanently. That year, she wrote a paper about an upcoming crossing of Jupiter and Saturn. This event was set to occur in 1714. In 1717, the academy punished Maria for being too involved in observatory life, especially at public events. Maria was removed from residence at the observatory and her scientific career was over. Maria died shortly after on December 29, 1720.



Astronomy

steam dreamers



Take Action

Complete four of the following:

Let's learn about constellations! Grab an adult and go online to learn about different constellations at https://bit.ly/ConstellationsActivity. Then, go outside one night and see if you can spot any constellations or see if you can be creative and make up your own!

2 Let's have a snack and learn about the moon's phases! Grab some sandwich cookies and let's get to learning. Visit https://bit.ly/CookieMoonPhases to get started.

- **3** Discover why the moon has craters with this activity. *Supplies:*
 - 4 cups of flour
 - ½ cup of baby oil
 - Small pebbles or rocks
 - Round cake pan

Directions:

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Mix the flour and the baby oil. Then, drop your pebbles or rocks from many different distances to see the craters that were left.

4 Visit a space museum with your troop or family.

Watch the first moon landing at https://bit.ly/Apollo11MoonWalk.

Make your own 3D solar system. Watch this video to learn how to get started: https://bit.ly/3DSolarSystemActivity.

Make "astronaut ice cream" with the help of an adult. Visit https://bit.ly/AstronautIceCream for instructions and a recipe.

Grab some friends and take a look for stars at night using a telescope. Create a map of the stars you observe.

19 🔀

steam dreamers April



Inventions are new things or items that people create. Once things are invented, we can talk about them in the past tense. For example, the computer was invented in 1943. When things are invented, they can be patented, meaning the property rights are protected. This helps prevent people from replicating ideas and gives credit to the original inventor. Not all inventions are physical items. For example, writers invent characters for their books. Let's discover some other inventions:

- Refrigerator, 1834
- TV, 1927
- Digital Camera, 1975
- Car, 1885
- Digital Music, 1970

steam dreamers April



Margaret E. Knight was born on February 14, 1838 in York, Maine. Her father passed away when she was young. She then moved to New Hampshire with her mother. Margaret received a basic education, but left school early to work in a cotton mill. At a young age, Margaret showed interest in woodworking tools. She said the only things she wanted were "a jack knife, a gimlet and pieces of wood." Her friends didn't understand her interest in tools, but it led to her first invention at the age of 12. She got the idea for her invention after witnessing a loom malfunction at the local cotton mill. She created a device that stopped the shuttles from falling out when a loom malfunctioned. This kept people safe by automatically turning off the machine. Her invention was used at multiple mills, but it was never patented. She worked at the mill throughout her teens. In her 20s and 30s, she worked short-term jobs doing home repairs and photography.

In 1867, Margaret worked at the Columbia Paper Bag Company in Springfield, Massachusetts. While working at the paper bag company, she noticed the bags were weak and narrow. She knew she could make them better. She invented a machine that folded and glued paper to form the flat bottom for paper bags. She created a wooden model of the machine, but she needed a working hot iron to apply for a patent

and enable the machine to function. In 1871, Margaret applied for her first patent, but Charles Annan stole her idea and petitioned for a similar patent. Charles worked in the machine shop where the hot iron for her machine was built. Margaret filed a patent interference lawsuit, awarding her with the patent in 1871 at the age of 32. Later, Margaret opened the Eastern Paper Bag Company in Hartford, Connecticut.

Throughout her lifetime, Margaret gained 87 patents - 27 of them were of well-known inventions. She created items such as the rotary engine and a dress/skirt shield. Altogether, she invented close to 100 items. She never married and passed away at the age of 76 on October 12, 1914. Today, she is recognized as the "first woman awarded a US [United States] patent" and a woman who "transgressed traditional gender roles" by following her passions and making a difference.



Inventions

steam dreamers April



Complete four of the following:

Build a mechanical hand.

Supplies:

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- Construction paper
 Tape
- Pencil
- ThreadStraws
- Scissors
- Directions:

Trace your hand on the construction paper and cut it out. Cut some of the straws into 14 small pieces about an inch long. Tape three of the small pieces on the fingers a little spaced out. All of the fingers but the thumb will have 3. The thumb will have 2. Tape a longer piece of straw on the palm under each of the fingers. Take your thread and tie a piece at the top of each finger first straw. Then thread it through the remaining straws for that finger. Gather all at the bottom and tie together. Put all the strings through another straw acting as the arm and pull. It should close the hand.

- 2 Channel your inner inventor and think like Margaret! Imagine an invention that you would create. Write it out and brainstorm how you would go about making it. Share your ideas with your friends and sister Girl Scouts.
- 3 Visit a maker's center and take one of the courses offered by the center.
- 4 Visit https://www.uspto.gov/kids/activities.html. Complete one of the activities from the website.
- 5 Make your own solar oven to make smores. Get started at https://bit.ly/SolarOvenSmoresActivity.
- 6 Make a bee house with the help of an adult. Visit https://bit.ly/MasonBeeHouseActivity for tips.
 - Create a poster representing Margaret and all the things she has done. Share the poster with your friends.
- 8 Watch a video about Margaret at https://bit.ly/MargaretKnightVideo.

Inventions

steam dreamers May



Discover

Aeronautical engineering consists of designing, building, testing and controlling machines that can fly. This includes working on airplanes, jets, helicopters and blimps. These items have one thing in common: They all fly within the Earth's atmosphere. Aeronautical engineers need to be good at mathematics and physics. Before an aircraft is flown, it is tested by an engineer for safety. Models are built to test and problem solve any issues. Let's discover some of the different types of aircraft built by aeronautical engineers:

- Airplane Has fixed wings, is heavier than air, is propelled by propellers and engines, and can only fly in one direction at a time.
- Helicopter Can fly up, down, sideways and backwards. It can hover in one spot and can fly low places.
- Blimp Filled with light gas to float in the sky, sort of like a balloon. Someone controls the pressure to help the blimp move up and down.



STEAM DREAMERS



Connect

Elsie MacGill was born on March 27, 1905 in Vancouver, Canada. Elsie was homeschooled, but her studies followed the same educational standards of the public school her older brother attended. Her homeschooling included drawing lessons and swimming lessons. She later attended King George Secondary School, and at the age of 16, she was accepted to the University of British Columbia.

Elsie's mother was an advocate for women's rights. She always encouraged Elsie to follow her dreams. Elsie wanted to study engineering and was admitted into the applied science program at the University of Toronto in 1923. During the summer months, Elsie worked in machine shops, repairing motors. While working at the shop, she developed an interest in aeronautical engineering. Before her graduation, Elsie contracted polio. She was told she would never walk again. She refused to accept this and regained the ability to walk with the support of two metal canes. In 1927, Elsie graduated from the University of Toronto. She was the first Canadian woman to earn an electrical engineering degree. She stated her "presence in the University of Toronto's engineering classes in 1923 certainly turned a few heads."

After graduation, she took a job working on aircrafts, which furthered her interest in aeronautics. She began taking part-time classes at the University of Michigan to study aeronautical engineering. By the fall of 1927, she was enrolled as a full-time student in the Master of Science Engineering program, where she began working on aircraft design. She also conducted research for the university's new aeronautical facility. In 1929, she became the first woman in North America to earn a master's degree in aeronautical engineering. In 1932, she started to earn her doctorate degree at Massachusetts Institute of Technology. To help pay for her studies, she wrote magazine articles about aircraft and flying. She graduated from Massachusetts Institute of Technology in 1934.

In 1942, Elsie was hired as Chief Aeronautical Engineer at Canadian Car and Foundry, becoming the first woman to hold this position. While working there, she designed and tested a new training aircraft called the Hurricane. By the time production ended, 1,400 Hurricanes had been built. Her role in this production made her famous. There was a comic book strip that appeared in True Comics in 1942 titled "Queen of the Hurricanes."

Elsie got married in 1943. She then moved to Toronto, where she and her husband set up an aeronautical consulting business. She continued to grow her aeronautical career, as well as advocate for women's rights. She stated, "Although I never learned to fly myself, I accompanied the pilots on all test flights – even the dangerous first flight – of any aircraft I worked on." Elsie passed away on November 4, 1980 in Cambridge, Massachusetts after suffering from a short illness.

steam dreamers May



Take Action

Complete four of the following:

- 1 Make an origami paper rocket at https://bit.ly/PaperRocketOrigami.
- 2 Have a paper plane throwing contest with your friends and sister Girl Scouts. Measure and record the distance. Let's see who can build the best paper airplane.
- 3 Let's build and fly a paper kite! Get started at https://bit.ly/KiteFlyingActivity.
- 4 Build your own bottle rockets. For building instructions, you can visit https://bit.ly/BottleRocketsActivity.
- 5 Design a comic book strip about Elsie MacGill.
- 6 Watch a short film about Elsie MacGill at https://bit.ly/ElsieMacGilVideo.
- 7 Take a virtual field trip of the Women's Rights National Historic Park in honor of Elsie's work in women's rights at https://bit.ly/WomensRightsNHP.
- 8 Invite a female engineer to come speak to your troop.

steam dreamers June



Music is a group of sounds that have been arranged or placed in a meaningful way. Playing music can be as simple as someone tapping on a drum, singing along to a song or playing instruments with several people in unison. Sometimes, musicians create and write music on their own. Other times, musicians play songs that have already been written. When musicians write music, they tend to use music notes to tell others how the tone should be played or sung. Sometimes, when writing music, musicians will play the arrangement with instruments. Instruments fall into four categories: stringed, wind, percussion, and keyboard. Let's discover some of the instruments in each of these categories:

- Stringed violins, harps or guitars. These instruments have tight strings that make sounds when you rub or pluck them.
- Wind trumpets, saxophones or clarinets. These instruments make sounds when you blow into them.
- Percussion drums and tambourines. These instruments make sounds when you it or shake them.
 - Keyboard pianos and accordions. These instruments make sounds when you press their keys or buttons.



Music

STEAM DREAMERS

June



Ella Fitzgerald was born on April 25, 1917 in Newport News, Virginia. Her parents split up soon after she was born. She then moved with her mom to Yonkers, New York. She lived in an apartment in a desegregated neighborhood with her mom and stepfather. In her neighborhood, Ella easily made new friends. Ella considered herself a tomboy and played in the neighborhood baseball games. She also enjoyed dancing and singing with her friends and would visit Apollo Theater to view shows. In 1932, Ella's mom died in a car accident. The loss of her mother was very difficult for Ella. Unable to adjust to uncertain times, Ella skipped school and her grades dropped. During this time, she got into legal trouble and was sent to reform school.

In 1934, Ella's name was picked from a weekly drawing at the Apollo Theater. She won the opportunity to compete in amateur night. She had planned to dance, but The Edward Sisters were the closing act of the show. Ella said, "They were the dancingest sisters around." Ella decided to change her act and sing instead. She chose to sing Hoagy Carmichael's song, "Judy," which she knew well because it was one of her mom's favorites. When she finished singing, the audience demanded an encore, so she continued to sing. Offstage, Ella was shy, quiet and self-conscious about her appearance and doubtful of her singing abilities. She said, "Once up there, I felt the acceptance and love from my audience. I knew I wanted to sing before people the rest of my life."

In the band that night was a saxophonist and arranger, Benny Carter. He was impressed with Ella's talent and began introducing her to people in the music industry. During the process, he and Ella became lifelong friends. Ella signed up for every talent show she could find. In January 1935, she won the chance to perform for a week with the Tiny Bradshaw Band at the Harlem Opera House. Ella met bandleader Chick Webb and he offered her the opportunity to test with the band. They played at Yale University during a dance. Ella was a hit. She was hired to travel with the band for \$12.50 a week.

Ella released her first single in 1936 called "Love and Kisses." The song had mild success. At the age of 21, she released a playful version of the nursery rhyme "A-Tisket, A-Tasket," and the album sold 1 million copies, was a number one hit and reached the top of the charts for 17 weeks. Chick Webb passed away in 1939. Ella took over as bandleader. She renamed the band "Ella Fitzgerald and Her Famous Band."

From 1956-1964, Ella recorded covers of other albums. This was widely popular with Ella's fans and the artists she covered. Ella continued to work as hard as she could, despite the negative effects it had on her health and relationships. She toured all over the world, sometimes doing two shows a day in different cities. In 1974, she spent two weeks in New York singing with Frank Sinatra and Count Basie. Five years later, she was inducted into the Down Beat Magazine Hall of Fame and received honors from the Kennedy Center for her contribution to the arts. In 1987, Ella received the National Medal of Arts from President Ronald Reagan. France followed two years later, presenting her with Commander of Art and Letter awards.

In 1986, Ella became sick and had surgery to try to help her heart. She had diabetes, and both of her legs were amputated. The disease led to poor eyesight, as well. Ella's doctor said she would never sing again because of her poor health. She proved her doctor wrong, and by the 1990s, she had recorded over 200 albums. In 1991, she had her final concert at New York's Carnegie Hall. Ella died of a stroke on June 15, 1996 in her Beverly Hills home. Music

steam dreamers June



Take Action



- Write your own song! Channel your inner Ella and get creative. Share your song with your friends and family.
- 2 Try a new instrument! Whether you have played one before or not, try it out.
- 3 Get creative and make music. Anything can be an instrument if you believe it. Use a pot or pan and a wooden spoon to beat along to a song!
- 4 With your troop or family, go listen to live music.
- 5 Go online and take a virtual tour of Apollo Theatre.
- 6 Listen to one of Ella Fitzgerald's songs and discuss how it made you feel.
- 7 Celebrate Ella's love of baseball and play a game outside with friends.
- 8 Host a talent show with your Girl Scout sisters.

steam dreamers July

Discover

DNA, also known as deoxyribonucleic acid, is an important molecule for life. This molecule holds the instructions that tell our bodies how to develop and function. Our bodies are made up of over 200 types of cells, which receive directions or instructions from our DNA. Even though there are only four different types of nucleotides, a DNA structure can be thousands of letters long, which allows for many different combinations. Within our DNA structures, there are genes. These genes tell our cells how to make specific proteins for our bodies to help us grow and live. Here are some interesting facts about DNA:

- 99.9% of DNA structures are the exact same in everyone, but that 0.1% is what makes us all different or unique.
- The DNA structure (or shape) was discovered by Dr. James Watson and Francis Crick in 1953.
- If you were to unravel a DNA structure, it could travel to the sun and back multiple times.
- DNA was first discovered in 1869 by Friedrich Meischer.



29

steam dreamers July

Connect

Rosalind Franklin was born on July 25, 1920 in London, England. At the age of six, Rosalind began attending a private day school in West London. Her aunt always described Rosalind as "alarmingly clever - she spends all her time doing arithmetic for pleasure." At the age of 11, she went to St. Paul's Girls' School - one of the few schools for girls in London that taught physics and chemistry. While in school, she learned German and French. She was top in her classes and frequently won annual awards. She was awarded with a scholarship for a university in 1938, but she declined the offer. She felt the scholarship should be given to someone who needed the money more than her.

Rosalind started at Newnham College in 1938, where she studied chemistry. There, she met Bill Price, who worked as a laboratory demonstrator and would later become one of her colleagues at King's College in London. In 1942, Rosalind was awarded second-class honors for her final exams. These honors were accepted as a bachelor's degree and allowed her to apply for jobs. Rosalind was awarded with a research fellowship at Newnham College in the physical chemistry lab, which she accepted.

During her last year at the college, she met Adrienne Weill, a French refugee. Adrienne helped Rosalind improve her French and introduced her to Marcel Mathieu. In 1945, Marcel worked as a director for a network of institutes that did major scientific research. This led to an interview with Jacques Mering at the Laboratoire Central des Services Chimiques in Paris. In 1947, she was hired as one of the 15 researchers for the lab. Jacques taught Rosalind techniques for applying X-ray crystallography to various substances.

In 1950, Rosalind was given a three-year fellowship to work at King's College in London. She started working as a research assistant in the Medical Research Council's Biophysics Unit. She was supposed to only research X-ray diffraction of proteins and lipids in solutions, but her work was redirected to DNA fibers. In 1953, she got into an argument with her director. She was told to move to Birkbeck College, where she was then offered her own research team. She died at the age of 37 in 1958 from ovarian cancer.

Rosalind is best known from her work with the X-ray images of DNA. Her work was vital for the discovery of the double helix DNA. Her colleagues were awarded the Nobel Prize in Physiology in 1962. They suggested that Rosalind be included in the nomination. Unfortunately, the Nobel Committee refused to include the deceased female scientist. At Birkbeck, her team continued her research on viruses and won the Nobel Prize in Chemistry in 1982.



steam dreamers July

Take Action

1

Complete four of the following:

- Build a DNA structure with mini marshmallows and twisted licorice candy. Get started by visiting https://bit.ly/DNAModelActivity.
- 2 Complete the family traits activity at https://bit.ly/FamilyTraitsActivity and share your findings with your Girl Scout sisters.
- 3 Let's discover if fingerprints are inherited by visiting https://bit.ly/FingerprintFun.
- 4 Play "Periodic Table Battleship" with your friends to learn all the elements of chemistry. View instructions at https://bit.ly/PeriodicTableBattleship
- 5 Invite a chemist to come and talk to your troop.
- 6 Visit https://bit.ly/RosalindFranklinVideo to watch a video about Rosalind.
- 7 Invite a radiologist to come and speak to your troop about X-rays.
- 8 Make a poster about all the things that Rosalind accomplished. Share it with your friends.

steam dreamers August



A branch of visual art, sculpting is the creation of a threedimensional object. The main features of a sculpture are the size, texture, light, shade and color. A sculpture may look exactly like a person or object, but it may also reflect the way the artist sees that person or object. Sculptures can be made out of many different materials, the most common being clay and metals. Most of the sculptures you see outside are made of stone, as it resists rain and wind damage. Sculptures are not just statues; they can be anything that can be created three-dimensionally. Let's discover things that are sculptures:

- Statues
- Coins/Medals
- Pottery
- Jewelry

All of these things have one thing in common: They are three-dimensional. Sculpting

steam dreamers August



Harriet Hosmer was born on October 9, 1830 in Watertown, Massachusetts. When she was young, her mother and three of her siblings passed away. Harriet was a small child and her father wanted her to be more physical. She became an expert in rowing, skating and riding. Her father also encouraged her to be artistic and to follow her passions.

At an early, age she started to make models out of clay. She also studied anatomy with her father, who was a physician. When she was older, Harriet attended an anatomy presentation by Dr. Joseph Nash McDowell at Missouri Medical College. His presentation inspired her to go to Boston to study, while continuing to practice her modeling at home. In November 1852, accompanied by her father and her girlfriend, Harriet moved to Rome to further practice her art. She studied under sculptor John Gibson.

Harriet liked the neoclassical style, which was very popular in Rome at the time. She also enjoyed studying mythology and designed sculptures based on the tales. Additionally, she crafted and constructed machinery in connection with her sculptures.

Harriet was one of the most financially successful sculptors during her lifetime - a notable achievement, considering the field was dominated by men at the time. She was famous for creating sculptures of women from mythology. She sculpted busts of Medusa and Daphne. In 1894, Harriet's last commissioned sculpture of Queen Isabella was unveiled. The sculpture had been requested by the city of San Francisco. She later died in Watertown, Massachusetts on February 21, 1908.



Sculpting

steam dreamers August





Take Action

7

8

Complete four of the following:

- 1 Let's create carboard disc sculptures. Visit https://bit.ly/DiscSculptureActivity to get some ideas.
- 2 Make a sculpture inspired by Alberto Giacometi. Visit https://bit.ly/GiacomettiActivity to learn how.
- 3 Create a sculpture out of recycled materials.
- 4 With some of your friends and Girl Scout sisters, play the statue game. For instructions on how to play, visit https://bit.ly/StatueGame.
- 5 Practice making a 3D object, like one of the ones listed previously.
- 6 Make your own clay artwork by following the instructions at https://bit.ly/ClaySculptureActivity. Share your creations with friends and family.
 - Visit https://bit.ly/HarrietHosmer to examine two works of Harriet's that are at the Smithsonian American Art Museum.
 - Review "Zenobia in Chains," a sculpture created by Harriet, at https://www.huntington.org/zenobia.

steam dreamers September

Mechanical Engineering

Discover

Mechanical engineering is the designing and building of machines. To be a mechanical engineer, you need to know and apply the basic concepts of chemistry, physics, chemical engineering, civil engineering and electrical engineering. Additionally, to work in the field, you need a degree. Cars and elevators are common devices that mechanical

engineers operate on. It is said that the first record of mechanical engineering dates back to 300 B.C., when people created simple machines to make their jobs or everyday lives easier. Let's discover other things that mechanical engineers work on:

- Ramps
- Catapults
- Roller Coasters
- Cars
- Rockets

steam dreamers September

Mechanical Engineering

Connect

Beatrice Shilling was born on March 8, 1909 in England. At the age of 14, she bought her first motorbike and fell in love with the vehicle. Determined to become an engineer, she received her bachelor's degree in electrical engineering in 1932. After completing school, she worked for an electrical engineering company for three years, where she installed wiring and generators. She stayed on for another year and obtained a master's degree in mechanical engineering. In her spare time, she raced motorbikes. She was even awarded the Gold Star for going 106 miles per hour in a lap on her Norton M30 bike!

After college, she struggled to find jobs due to the Great Depression. Eventually, she found a job as a research assistant at the University of Birmingham. In 1936, she was recruited as a scientific officer for the Royal Aircraft Establishment (RAF). Initially, she

worked as a technical author, but was later transferred to work on aircraft engines. In November 1939, she was promoted to the technical officer in charge of carburetor research and development. She was later promoted again to a principal technical officer position. During World War II, Beatrice worked on fighter pilot planes that malfunctioned. After the war, Beatrice and her husband raced cars, which they worked on in their home workshop. She retired from RAF in 1969. Beatrice died at the age of 81 on November 18, 1990.



steam dreamers September

Mechanical Engineering

Take Action

Complete four of the following:

- 1 Create a marble run made with items from around your home. An example of a marble run can be found at https://fun-a-day.com/marble-course/.
- 2 Design and test your own car. Share what you have made with your friends and sister Girl Scouts. For inspiration on types of cars you can build, visit https://bit.ly/WindCarActivity.
- **3** Complete a pulley experiment at https://bit.ly/PulleyActivity.
- 4 Grab some friends and complete the wrecking ball challenge at https://bit.ly/WreckingBallActivity.
- 5 Watch a video about Beatrice at https://bit.ly/BeatriceShillingVideo.
- 6 Invite a mechanical engineer or electrical engineer to come and speak to your troop.
- 7 Challenge your friends to an egg drop challenge. See whose egg can survive the longest. Use recycled items to protect your egg from harm.
- 8 Invite a mechanic to come speak to your troop about what it is like to work on motorcycles.

steam dreamers Notes



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