Ages
5-7

Stella STEM's activity pack

CGI

Let's go full steam on STEM, what do you say! Chug chug chug choo choo… who wants to join the train and be the next engineer to build something cool to go full speed, or fly super high to Mars? Maybe swim to the deepest ocean to conduct experiments, or wear the safety goggles and brew something fun like Hermione from Harry Potter. Maybe notice how math plays a role beyond the calculations on paper and not to forget, maybe just sit back, relax and watch the sunset, or the night sky and see the magic of science happening all around us – all the time!

Did you know there are some incredible girls who are the reason behind discovering the magic of science? They are considered the superstars, the science fairies, and powerful heroes and guess what, you can be one too – but only if you put your mind to it!

I hope you enjoy participating in the Stella STEM pack and have just as much fun as I did when I was a little girl. I went on to study engineering and got my master's degree in computer engineering – because I loved to study the magic of science like wireless technology, understanding how plants grow, how planets revolve, and so much more.

Tezeswari Nettimi
U.S. Federal Women's Forum President

Hi girls!

Did you know there was a whole month dedicated to celebrating the accomplishments of women? Women's History Month is celebrated each year in March and is a time for reflection and appreciation of the contributions of women. How cool is that?! In this packet, you will learn about some extraordinary women and their contributions to STEM—Science, Technology, Engineering and Math.

In the U.S., there are more jobs in STEM than there are qualified people to do those jobs. Do you enjoy solving problems and trying to make things better? If so, STEM is for you! STEM is used to help solve every day, real world problems such as curbing world hunger, providing fresh water and creating "green" energy, to name a few.

As you complete the enclosed activities, I encourage you to think about your future and the footprint you want to leave on the world. You are smart. You are strong. You can make a difference.

Ashton Parmer
U.S. CSG Women's Forum President

Hi Girls!

My name is Interstella, but you can call me **Stella STEM!**

Have you heard of STEM? It stands for Science, Technology, Engineering and Math! These subjects help our world develop and make new things for you and me.

I love learning all about STEM, especially the women in STEM who have helped our world become what we know today. I would love to share some stories with you, so you too can see the brilliant things that these women have created. These American women were just girls like you and me once, they loved STEM and went on to do amazing things!

Come and join me on an adventure into the world of STEM. There's going to be lots of fun along the way. Let's GO!

Science

Science helps us to understand how the world works, through things such as experiments and observations. One of my favorite things about science is space! Astronomers are scientists who learn all about outer space, teaching us loads of cool stuff about our solar system!

What is our solar system?

Our solar system is made up of our sun, and everything that orbits (circles around) it. This includes the planets and their moons, asteroids, comets and meteoroids.

The planets are (in order of their distance from the sun):

- **M**ercury
- **V**enus
- **E**arth (you live here!)
- **M**ars
- **J**upiter
- **S**aturn
- **U**ranus
- **N**eptune
- **P**luto (Dwarf Planet)

A mnemonic is an easy way to remember the order of the planets. The first letter of each word gives you the first letter of the planets, in order:

- **M**y
- **V**ery
- **E**nthusiastic
- **M**other
- **J**ust
- **S**erved
- **U**s
- **N**ine
- **P**lanets

Pluto is a dwarf planet, so it is different from the other planets. It is still a planet because it orbits our sun, however unlike other planets, it has not managed to clear its surrounding area of other space debris.

Christa McAuliffe

1948 – 1986

American

Known for:

She was the first private citizen passenger in the history of space flight.

McAuliffe was the first and only high school teacher selected to go into space as part of NASA's Teacher in Space Project in 1985.

In 1981, after moving to Concord, New Hampshire with her family, she began teaching high school. There she had her students watch and take notes as the first space shuttle traveled around the Earth. McAuliffe applied to NASA's "Teacher in Space" program to fulfill a long-time dream of flying on a space shuttle. She was selected among over 11,000 applicants!

After a year of intense NASA training, the shuttle mission, the STS-51L, was to be her first shuttle mission to space. On January 28, 1986, the Space Shuttle Challenger exploded within two minutes of launch and all seven crew members died including McAuliffe. In 2004, she was posthumously awarded the Congressional Space Medal of Honor.

Dr. Cecilia Payne-Gaposchkin

1900 – 1979

American

Known for:

Theorizing that stars were mostly made from hydrogen and helium.

Dr. Payne-Gaposchkin was a star-gazing genius.

She studied at Cambridge University in the United Kingdom, however was not awarded a degree because she was a woman.

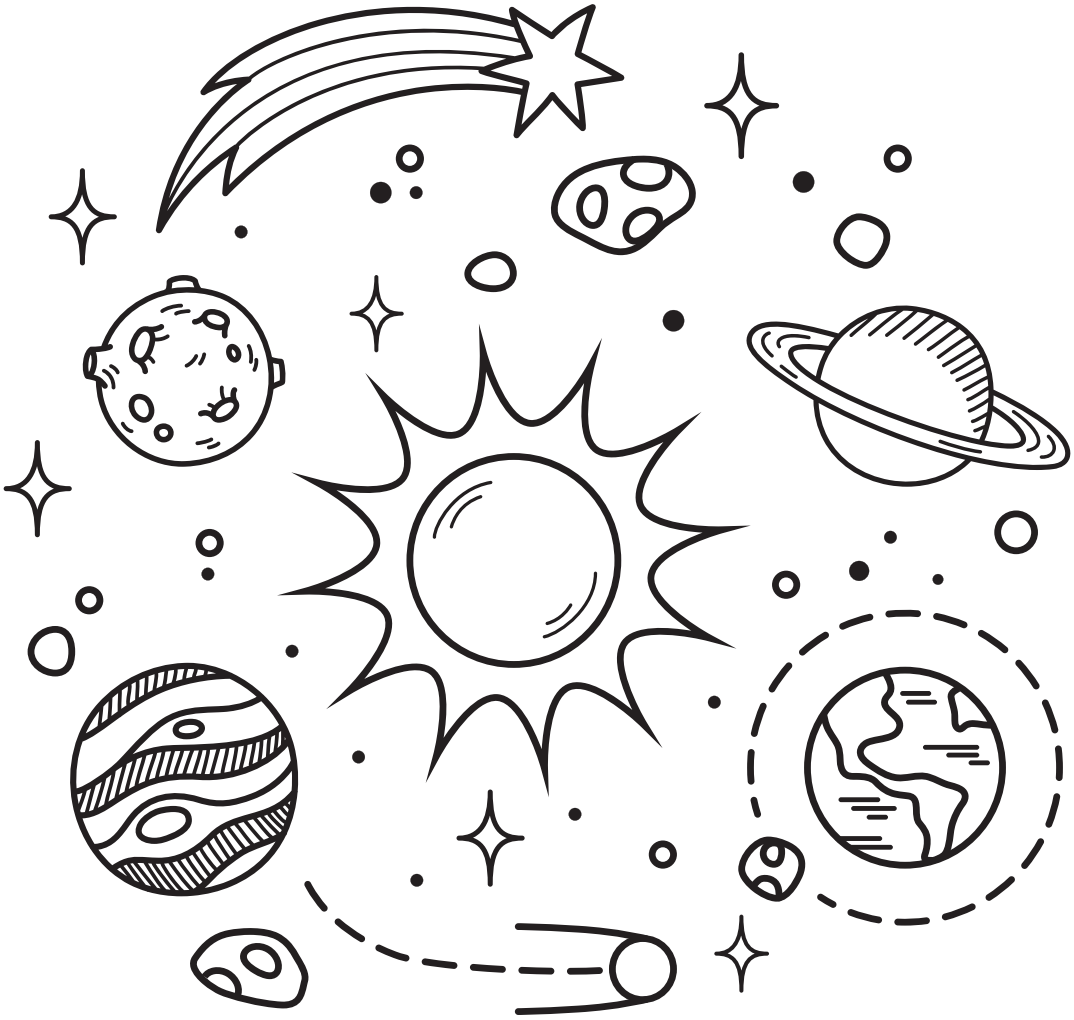
She discovered that hydrogen was the most common element, and that stars were balls of gas made mostly from hydrogen and helium. Her theory was rejected because it didn't match what people believed at the time, however it was later proved correct and re-published by a man who claimed the theory as his own and took the credit.

In 1925 she became the first person to earn a doctorate in astronomy from Radcliffe College of Harvard University.

The work of her and her husband, astrophysicist Sergie Gaposchkin, changed people's understanding of the universe.

Science

Color in the picture and circle the items that are planets...



Solution can be found on page 26

Science

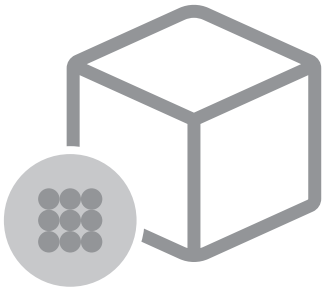
Scientists also study teeny-weeny particles called atoms and molecules. These particles come together to form something called matter. Matter can take three different forms. I bet you know some already!

How about the chairs in your classroom, or the water in your bottle? Even the air you breathe is a state of matter.

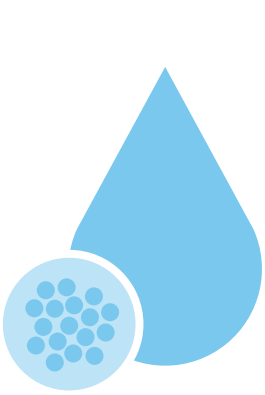
States of matter

Solid, liquid and gas are the three states of matter.

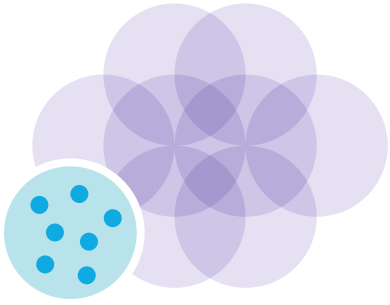
Matter is made up of particles and can change state when energy is added to it, in the form of heat or pressure.



A **solid** contains particles that have no room to move around.



A **liquid** contains particles that can move around but stay connected to each other.



A **gas** contains particles that can move around freely and usually bump into each other.

Gases do not have a fixed shape. They spread out and change shape and volume to fill up the container they are in!

Stephanie Kwolek

1923 – 2014

American

Known for:

Inventing Kevlar®.

Kwolek's invention was bullet-proof!

She got a job at DuPont Chemical Company due to a shortage of men from World War II. She discovered a waste product that was normally thrown away after an experiment, and convinced the technician to test it for her. They found the fiber to be five times stronger than steel! This fiber later became known as Kevlar®, which is the material used to make bullet-proof vests!

Science

States of matter

These items are all different states of matter.

Draw each of the items below in the correct box. Is it a solid, a liquid or a gas?


Air in a balloon

Milk


Apple


Honey


Clouds


Teddy Bear


Cake


Juice

Solid	Liquid	Gas

Solution can be found on page 26

Alice Ball

1892 – 1916

American

Known for:

Developing the first useful treatment for leprosy.

Ball was the first African-American and the first woman to graduate from the University of Hawaii.

She got a Master of Science degree in Chemistry, and went on to work at this university as a chemistry instructor when she was only 23 years old.

In this role, she researched treatments for an illness called leprosy. Sadly, Ball died due to a research related accident aged just 24, before she was able to publish her research findings. Upon her death, her findings were taken by the head of the university, who claimed them as his own. He published the findings under his own name, and Ball didn't get any credit until many years later.

Technology

Technology can be anything that is created by humans to help solve problems and make our lives easier!

Computers are a great example of how technology has done just this. Can you think of a way in which a computer helps to make your life easier?

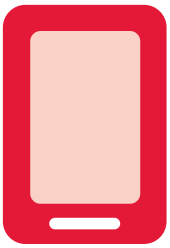
What is a computer?

Computers work by following instructions called code. The instructions are written by people called computer programmers and software developers. The instructions tell the computer what to do.

Computers are used for lots of things - writing books, creating videos, making games, creating websites, downloading our favorite music and more!

Not all computers look alike. Here are some examples of different types of computer.

Laptop



Tablet

PC

Smartphone

Dr. Shirley Ann Jackson

Born in 1946

American

Known for:

Breakthrough research in telecommunications.

This highly esteemed woman is the reason we can enjoy solar cells, fiber optic cables, caller ID and call waiting!

Dr. Jackson began her interest in science by studying how bumblebees reacted to changes in diet and exposure to light. Even though she experienced rejection because she was black from other students during her time at MIT, she was determined to be resilient and completed her undergraduate and graduate work in physics. She is the first African-American woman to earn a Ph.D from MIT, to be elected to the National Academy of Engineering, to be appointed chair of the U.S. Nuclear Regulatory Commission, and to be president of Rensselaer Polytechnic Institute.

Her outstanding work at Bell Laboratories in New Jersey focusing on how electrons organized themselves in layers and clustered in repeated patterns that changed the temperature of materials provided the research that led to the development of technology that transmits power for computers and the telecommunications industry using software programs.

Technology

Let's program a cake!

Making a cake is a lot like coding. We need a list of instructions to tell us how to make the cake, and the instructions must all be in the right order.

My instructions have become muddled. Can you help me to figure out the correct order by numbering the list of instructions from 1 to 8?

	Pour the mixture into the cake tin
	Put all the equipment on the counter
	Put the cake tin into the oven and bake the cake
	Mix the icing in a bowl
	Take the cake tin out of the oven and place it on the counter to cool
	Mix flour, eggs, milk and sugar in a bowl
	Put the icing on the cake
	Cut and eat the cake

Solution can be found on page 27

Dr. Katie Bouman

Born 1989

American

Known for:

Creating the first image of a black hole.

Dr. Bouman and her team captured the first image of a black hole!

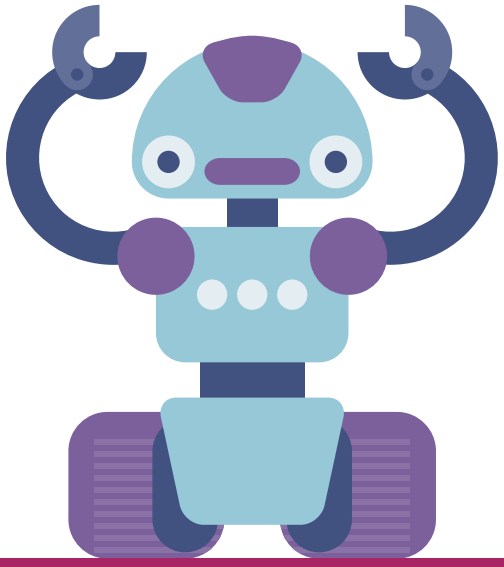
She led the development of the computer program that made the breakthrough image possible, captured in 2019.

Before this, no image had ever been taken of a black hole, and it is thought that this may revolutionize our understanding of the universe.

Engineering

Engineers solve problems with their inventions. They love figuring out how and why things work. But before things are built (or created), they need to be planned out, which is called engineering.

Do you like engineering things? I do. One of my favorite activities is making a robot out of junk modelling and imagining what jobs it might do.



What job would you have your robot do?

What are robots?

Robots are machines designed to follow instructions and do lots of different jobs – even the ones humans can't do. Robots only do the specific jobs that a person has built them to do.

Robots are used for lots of things - making cars, fixing things, cleaning, cooking and even having them as friends!

What have you seen robots do before?

Some robots work on Mars!

Emily Roebling

1843 – 1903

American

Known for:

She played a major role in the construction of the Brooklyn Bridge.

Roebling built bridges (literally!) for women in STEM.

Her husband was the chief engineer on the construction project for the Brooklyn Bridge, the longest suspension bridge in the world. However, after he developed a debilitating illness she took over much of the chief engineer duties, including day-to-day supervision and project management.

She was the first person to cross the bridge by carriage and today the bridge is marked with a plaque dedicated to her memory.

Engineering

Color me in!

Color each square of the robot using the color-coded numbers.
For example, number 3 should be colored grey.

				3	3	3	3	3				
				3	1	3	1	3				
				3	3	3	3	3				
				3	6	6	6	3				
	4	4	3	3	3	3	3	3	3	4	4	
	4	4	3	5	5	5	5	5	3	4	4	
	3		3	5	2	2	2	5	3		3	
	3		3	5	2	2	2	5	3		3	
7	7	7	3	5	2	2	2	5	3	7	7	7
7		7	3	3	3	3	3	3	3	7		7
				3	3		3	3				
				3	3		3	3				
				3	3		3	3				
			7	7	7		7	7	7			

1	Yellow
2	Orange
3	Grey
4	Green
5	Purple
6	Black
7	Red

Solution can be found on page 27

Scarlin Hernandez

Born in 1991

American

Known for:

Spacecraft engineer for NASA's signature space mission, the James Webb Space Telescope used to discover new planets.

As mission lead for the telescope, this amazing woman tests the ground systems that will command and control the space telescope after it has been launched into space in 2021!

Hernandez moved to America from the Dominican Republic when she was 4 years old. After being granted a National Science Foundation scholarship to Capitol Technology University (CTU) in Laurel, MD, she graduated in computer engineering but found she was more interested in Astronautical Engineering. She obtained an internship with NASA's Goddard Space Flight Center and by the time she was 20 years old, she became the mission planning lead for the Tropical Rainfall Measuring Mission (TRMM) satellite.

Today, she works on NASA's signature space mission, the James Webb Space Telescope, testing ground systems that will command and control how the telescope will discover new planets and the first stars after the dark ages! This new telescope, planned to succeed NASA's Hubble Telescope, launched in fall 2021.

Math

Math is all around us. We use math to tell the time, to play games, to build things and do all sorts of different work.

I will even be using math to help me divide up some pizzas later on. I'll be using fractions to do this and I'll need your help!

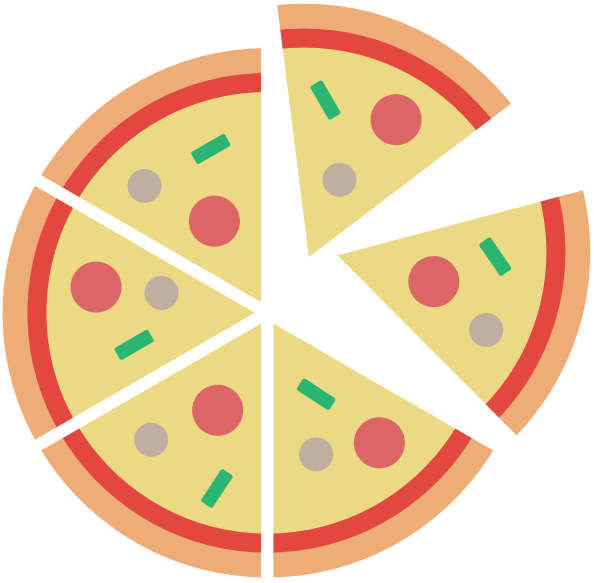
1/4 1/2 3/4

What are fractions?

Fractions are parts of a whole thing or number. Here is an example of a fraction: ¼ (one quarter).

The top number is called the numerator and the bottom number is called the denominator.

A simple way to think of fractions is by imaging them as slices of pizza. If you divide a pizza into 6 slices and someone takes 2 slices, then they have a fraction of 2/6.



Dr. Julia Robinson

1919 – 1985

American

Known for:

Solving various mathematical problems.

Dr. Robinson was an award-winning math genius!

As a child, Dr. Robinson got sick with both scarlet fever and rheumatic fever and by the time she was better, had missed two years of school. In only one year, working with a tutor for three mornings a week, she was able to cover four years worth of school work!

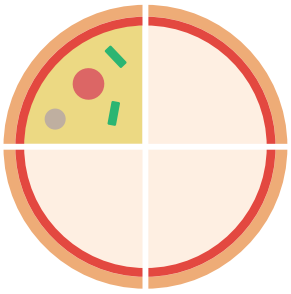
She returned to school and by her final year she was the only girl in her math and physics classes. She did very well and received awards in both subjects, as well as the Bausch-Lomb Award for the Best Science Pupil.

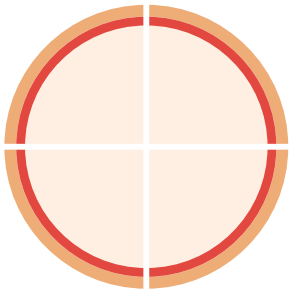
She later worked as a mathematician in a university and published a number of papers that aided in the solution of a number of problems.

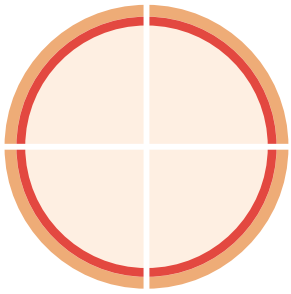
Math

Can you help me get these pizzas ready for the party?

I have colored in the first pizza fraction. Can you do the rest?
The fraction tells you how much of the pizza needs to be colored in.

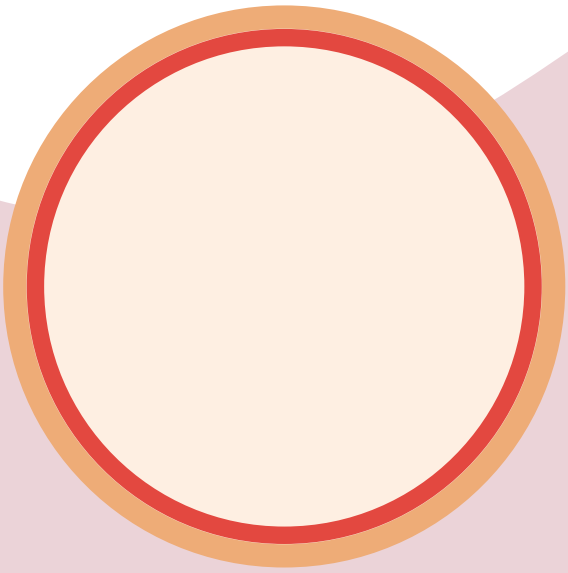
1/4 

3/4 

1/2 

Pizza party!

Can you create your favorite pizza
and then divide it into
6 equal slices for you and
your friends?



Solution can be found on page 28

Hedy Lamarr

1914 - 2000

American

Known for:

Being an actress, engineer, and mathematician.

Lamarr's work provided the foundation for our GPS, WiFi, and Bluetooth® technology!

This Austrian-American actress was not only talented on the big screen but also as an engineer and mathematician. During World War II she wanted to contribute to the war effort. Working along with George Antheil, who was a musician and composer, Lamarr developed a type of "frequency hopping," which would encrypt torpedo control signals, preventing enemies from jamming them and sending the torpedoes off course. She and Antheil patented the torpedo technology but it went unused for over 20 years! Today, her spread-spectrum technology work has provided the needed foundation all the portable devices we use every day. She was inducted into the National Inventors Hall of Fame in 2014.

Image Attributions

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Katie Bouman
Courtesy of Katie Bouman

Julia Robinson
https://upload.wikimedia.org/wikipedia/commons/1/10/Julia_Robinson_1975.jpg

Christa McAuliffe
https://www.flickr.com/photos/nasa2explore/10821099166

Dr. Shirley Ann Jackson
https://commons.wikimedia.org/wiki/Category:Shirley_Ann_Jackson

Scarlin Hernandez
Image Credit: "Hispanic Network Magazine Honors NASA Goddard Engineer Scarlin Hernandez – Office of Diversity and Equal Opportunity." Blogs.Nasa.Gov, blogs.nasa.gov/odeo/2018/08/17/hispanic-network-magazine-honors-nasa-goddard-engineer-scarlin-hernandez/. Accessed 23 Apr. 2020.

Hedy Lamarr
https://commons.wikimedia.org/wiki/File:Hedy_Lamarr_Publicity_Photo_for_The_Heavenly_Body_1944.jpg

Grace Hopper

Alice Ball
https://en.wikipedia.org/wiki/Alice_Ball

Emily Roebling
https://en.wikipedia.org/wiki/Emily_Warren_Roebling

Cecilia Payne-Gaposchkin
https://en.wikipedia.org/wiki/Cecilia_Payne-Gaposchkin

Well girls, it looks like we've reached the end of our journey through STEM. I had lots of fun – I hope you did too!

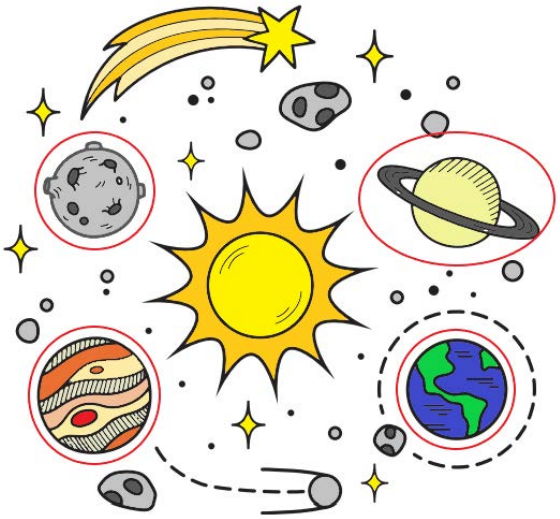
STEM is the way our world is created from the imagination to solve problems that sometimes we don't even know exist. It is all around us! The creativity, bravery and courage of women like you in STEM have reinvented our world! Can you imagine not having your cell phone or TV streaming? Without women taking their place in STEM, we would never have Bluetooth®, WiFi, fiber optic cables and the caller ID technology we use for our cell phones, televisions, and Internet service we use every day. This technology including solar cells makes it possible for us to communicate to friends around the world with satellites, heat our homes, explore planets like Mars and so much more.

If you're interested in learning more about women in STEM, there are loads of great books to read and women to learn about. Ask your teachers and parents about these, and see what else you can learn!

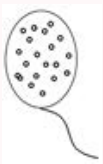
U.S. FEDERAL

CGI

Answer keys



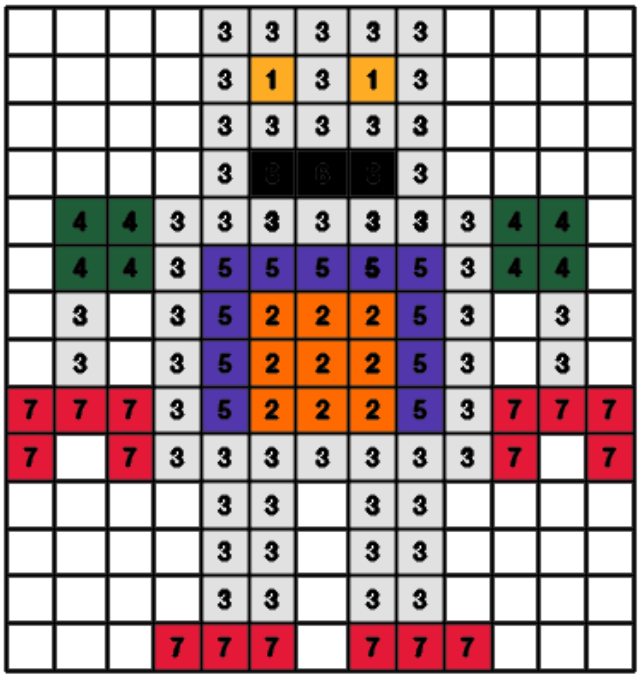
From page 7

Solid	Liquid	Gas
  	  	 

From page 10

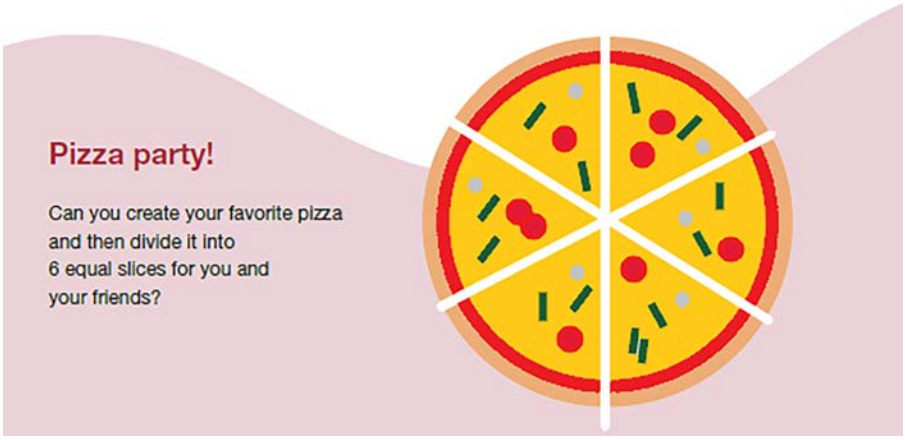
3	Pour the mixture into the cake tin
1	Put all the equipment on the counter
4	Put the cake tin into the oven and bake the cake
6	Mix the icing in a bowl
5	Take the cake tin out of the oven and place it on the counter to cool
2	Mix flour, eggs, milk and sugar in a bowl
7	Put the icing on the cake
8	Cut and eat the cake

From page 14



From page 18


1/4
3/4
1/2


Pizza party!
Can you create your favorite pizza
and then divide it into
6 equal slices for you and
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From page 22