C5ISR CENTER STEM@Home

Welcome to STEM@Home!

As we maneuver the challenges of the COVID-19 epidemic, we strive to continue to make STEM accessible to all.

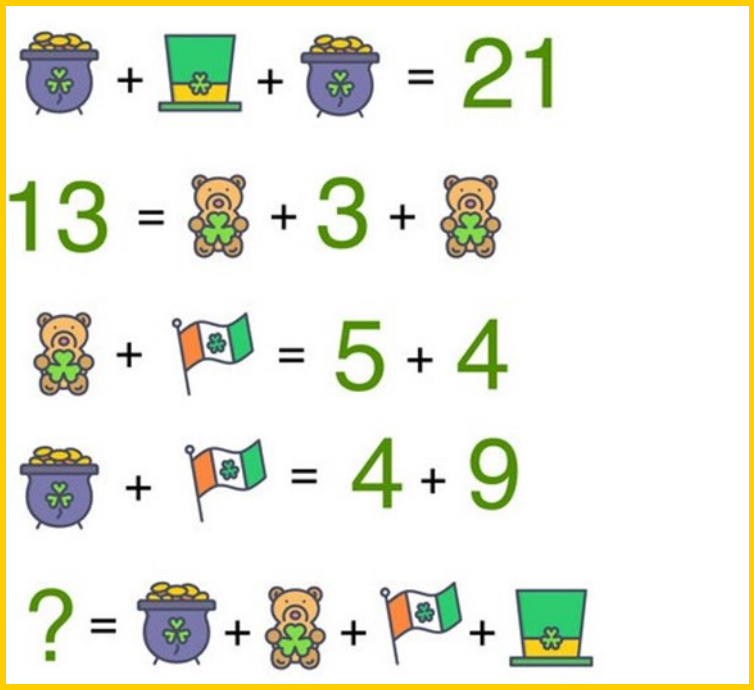
The STEM@Home Newsletter is intended to be a resource to provide engaging and educational activities that can be done with minimal materials and a whole lot of imagination.

In this Issue...

Issue 23

Brain Teaser: St. Patrick's Day Math Challenge

Use your math skills to find the value of each icon.



Hint: Start with the teddy bear!

Solution on Page 3

SHARE YOUR STEM!

Visit the C5ISR Center on Facebook to post a photo of your child completing one of the STEM@Home Activities.

#C5ISRCenterSTEM

Facebook.com/DEVCOM.C5ISR

Introducing Mr. James Sroczynski

Name:
Mr. James Sroczynski

Job Title:
Chief Engineer, C5ISR Prototype Integration Facility

Length of Time with the U.S. Army: 25 years

Education:

Bachelor of Science in in Mechanical Engineering, Rutgers University, New Jersey

Master of Science in Aeronautical Engineering, Rensselaer Polytechnic Institute, New York

How does your job support the U.S. Soldier? Here at the C5ISR Prototype Integration Facility (PIF), we design and build prototype systems for the Army. The work we do puts new technology like advanced computers and communications systems onto the vehicles and into the command posts that our Soldiers need to do their jobs. As chief engineer, I am part of the group at the PIF that helps to manage these prototype integration projects.

What is a typical day or a week like for you? Each day brings something new and different. On some days, I get to perform design reviews, where I look at the work that our engineers and computer-aided design (CAD) designers have done to ensure that what we are designing will meet the customer's needs, that it will perform well, and be safe for the Soldiers to use. On other days, I help people in the PIF with advice and information based on my experience. Right now, we are looking at ways to improve software that our electrical engineers use for CAD.

What drew you to the STEM field originally? Ever since I was young, I always loved trying to figure out how things work, and I would take them apart and put them back together again. I also enjoyed science fiction that showed how technology would help to make the future better for us, and by extension, I became interested in following the adventures of our real-life space program. All of this combined got me interested in math and science in school, and ultimately, led me to pursue degrees in engineering.

Why is STEM important to our national security and our national future? STEM advancements have always transformed the military, and they will continue to in the future. To maintain national technological leadership and to provide an advantage for our military against our country's adversaries, it is important that we continue to value and promote the advancement of STEM in every generation.

How should students further their interests in a STEM field? There are so many ways now to explore and get information, much of it at our fingertips thanks to the internet. There are magazines, websites, and podcasts that cover all kinds of STEM topics. You can also get involved with STEM groups and clubs that interest you like the C5ISR Center Math & Science Summer Camp. Finally, don't forget to stretch your imagination with some good science fiction books and movies.

What is the most important STEM-related innovation you've witnessed in your career? We take for granted having a smartphone around that gives us all instant connectivity, communication, and the combined knowledge of the world at our fingertips. When I first started at the C5ISR Center, the Army was just beginning to experiment with what was then called "digitizing the Army," and I was able to work on some of those early prototype systems. Putting IT technology into the hands of our Soldiers has been the most transformational technology innovation that I have seen.

What is your favorite technology for personal use? I haven't purchased a 3-D printer for home yet, so I'd have to say my favorite personal technology is my computer and the internet. I use it for so many different things, from staying connected to my distant family members to entertainment like reading, streaming movies, watching TV, and listening to music. It's also useful in working on my other hobbies like family history and model railroading. It has become so engrained in my life that it's hard to remember what life was like without it.

What is the next great technological frontier? I have to give you two answers here. The first is what's being called the Fourth Industrial Revolution – the digital transformation of manufacturing that has already begun in areas like 3-D printing, interconnected and automated "smart" manufacturing, and designing in virtual digital environments and augmented reality. The second frontier is one of my favorites – pushing the boundaries of human exploration of space. The recent success of the commercial space launch programs at NASA are starting to show us glimpses of our future in space. It fills the imagination with wonder and excitement to think about living on the moon and going to Mars and beyond.

Why is it important for engineers and scientists to engage with STEM Outreach? Our future will be more and more tied to and interwoven with technology – even more so than it has been so far. It is important for all of us who work in STEM to be engaged in outreach to help encourage young men and women to explore these areas and to follow their STEM interests. There are so many great STEM careers available, and these students will be the ones who will develop new technologies and help turn all of our dreams for the future into reality.

STEM Challenge

Materials	Cost
Newspaper	$70 per sheet
Cardboard piece	$200
Printer paper	$50 per sheet
Construction paper	$60 per sheet
Popsicle sticks	$100 for ten sticks
Straws	$75 for eight straws
Glue	$50
Cardboard paper towel/ toilet paper roll	$150
Tape	$50 for 12 inches
Cups	$250
Other item of choice (not listed)	$250

Additional Materials:
Scissors, paper, pencil

Ask a grownup for permission to use these items.

Guard the Gold STEM Challenge

A leprechaun's life is a constant struggle to keep from getting caught and protecting his gold from treasure-hunting thieves. With St. Patrick's Day just around the corner, treasure-hunter thieves are on the lookout for Lucky the Leprechaun and his gold.

Mission:

Lucky the Leprechaun needs your help! He has contacted you as an engineer to design a device to guard his gold from thieves.

Requirements:

- The device must conceal the gold in some way.
- Lucky must be able activate the device quickly and be able to access it.

Extra Challenge: Design your product within a budget of $1,000 using the cost list on the side.

Design Process:

ASK: What is the problem you need to solve? Design a device that will protect Lucky the Leprechaun's gold.

IMAGINE: Brainstorm and decide on one idea. How will your device protect Lucky's gold?

PLAN: Draw a picture of your device to guard the gold. What will your device look like?

CREATE: Use materials to create a prototype of your device.

IMPROVE: How can you improve your device to guard the gold?

⇒ If you had more choices of materials, what would you use and why?

SHARE: Show your device to guard gold to your family and explain how it works.

Ask an adult to
Share your STEM on Facebook.

Facebook.com/DEVCOM.C5ISR

#C5ISRCenterSTEM

Answer Key to puzzle on p. 1:

Top Hat = 3
Pot of Gold = 9
Teddy Bear = 5
Irish Flag = 4

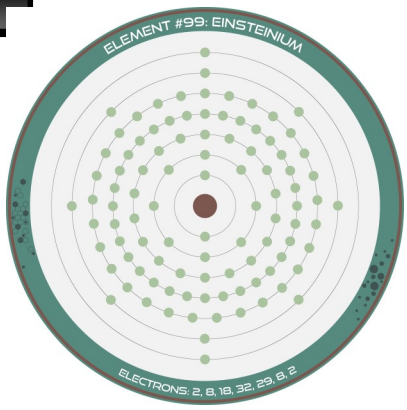
? = 21

AEOP offers our nation's youth and teachers opportunities for meaningful, real-world STEM experiences, competitions and paid internships alongside Army researchers.

Learn more at:
www.usaeop.com

STEM IN THE NEWS

First Measurements of Einsteinium



Element 99 on the periodic table, better known as einsteinium, has been quite a mystery since its discovery in 1952. Found among debris of the first hydrogen bomb, scientists have been unable to learn more about the element due to it being radioactive and difficult to create. A team of scientists and chemists has recently overcome these obstacles to report the first real study of the element. By successfully experimenting and correctly characterizing some of its properties, the team was able to open doors toward understanding einsteinium as well as some of other elements of the actinide series.

The team was led by Lawrence Berkeley National Laboratory scientist Rebecca Abergel and Los Alamos National Laboratory scientist Stosh Kozimor. The team also included scientists from both laboratories as well as graduate students and post-doctoral fellows from the University of California - Berkeley and Georgetown University. Using less than 250 nanograms of the element, the team tested and measured the first-ever einsteinium bond distance, which is an element's interactions with other atoms and molecules.

The team used new technology and facilities to test the element, which was not available when einsteinium was first discovered. However, getting the sample in a usable form was a huge obstacle for the team. Abergel jokingly called the study, published in the scientific journal *Nature*, a "long series of unfortunate events." The team first created the element in the Oak Ridge National Laboratory using the lab's High Flux Isotope Reactor. Oak Ridge Lab is one of the only places in the world capable of making einsteinium. Once the material had been created, the team discovered the sample had been contaminated, and the team's original plan of using X-ray crystallography, the previous standard of obtaining information on radioactive elements, had to be scraped and a new plan was formed.

Researchers at the Los Alamos lab were able to come up with a new way to make pure samples of einsteinium, and they created a sample holder uniquely suited to the element's properties. However, new challenges arose when the team had to contend with radioactive decay. While the team was able to conduct many of their experiments before the COVID-19 pandemic, their plans for follow-up experiments were interrupted due to shutdowns. By the time they were able to get back in the lab, most of the sample was gone.

Still, the team was able to measure a bond distance with einsteinium. Abergal noted that determining bond distance may not sound interesting, but it's the first thing a scientist wants to know about how a metal binds to other molecules, and what kind of chemical reaction is the element going to have with other atoms and molecules. These discoveries could lead to more findings about other elements that have not yet been discovered in the periodic table, potentially exploring what is beyond the edge of the periodic table.

Sources and Resources:

www.sciencedaily.com/releases/2021/02/210206125326.htm
www.nytimes.com/2021/02/07/science/einsteinium-chemistry-elements.html
www.rsc.org/periodic-table/element/99/einsteinium

Did you know?

Einsteinium is created in very small amounts from bombarding plutonium with neutrons in a nuclear reactor.

STEM Activity/Challenge

Sticky Ice Experiment

Have you ever wondered why trucks put salt on the roads before a snow or ice storm? This simple science experiment may seem like magic, but it will show you how salt affects the freezing point of water.

Materials:

- 2 small bowls of water
- A 12 inch piece of string
- Cold water
- A bowl of ice cubes
- Table salt

SAFETY NOTICE

Make sure you have an adult's permission and supervision before beginning this activity.

Directions

1. Put your ice cubes in one bowl and your cold water in the second bowl and have your salt ready.
2. Take a few ice cubes and place them in your cold water and try to pick up the ice using your string. Did it work?
3. Sprinkle some salt on the ice in the water and you should notice that it will melt a little bit.
4. Place the string on the ice that is in the water and sprinkle some salt over the string and ice.
5. Press the string on the ice and count for 60 seconds.
6. Carefully lift your string up and observe what happened to the ice.

Science Explained

You should have noticed when you pulled the string up that the ice was attached to it. When you sprinkled the salt on the ice, it caused the ice to start melting. Water freezes at 32 degrees Fahrenheit, and when salt is added to ice, it lowers the freezing point of the water, which lowers the freezing point below the ice's temperature and creates more liquid water. This is known as freezing point depression, and the more salt you add, the more your lower the freezing point. In addition to the salt, the ice has to absorb heat from its surroundings. In the case of this experiment, the ice absorbed heat from the cold water that surrounded it. You may notice in the winter time that there are trucks putting salt on the road, and the reason is because salt lowers the freezing point of water, as you learned in this experiment.

Resource:

www.scientificamerican.com/article/why-do-we-put-salt-on-icy/

COME & GET YOUR STEM ON...

The C5ISR Center Community Outreach Program is dedicated to providing quality STEM programs to students K-12. For more information about our STEM Outreach Programs, visit us on the web:

https://c5isr.ccdc.army.mil/student_programs/

***Due to COVID-19, programs are currently virtual.**