

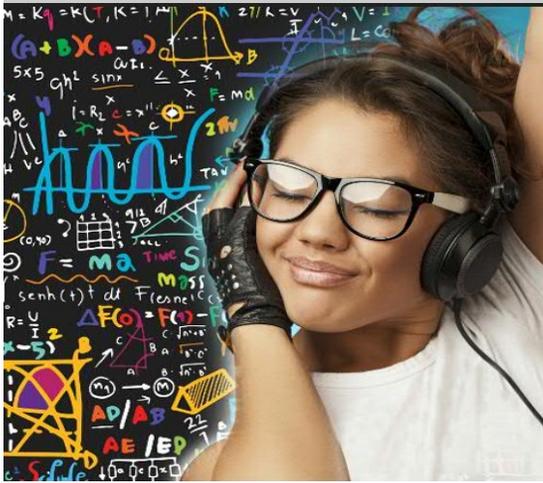


C5ISR CENTER STEM@Home

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.



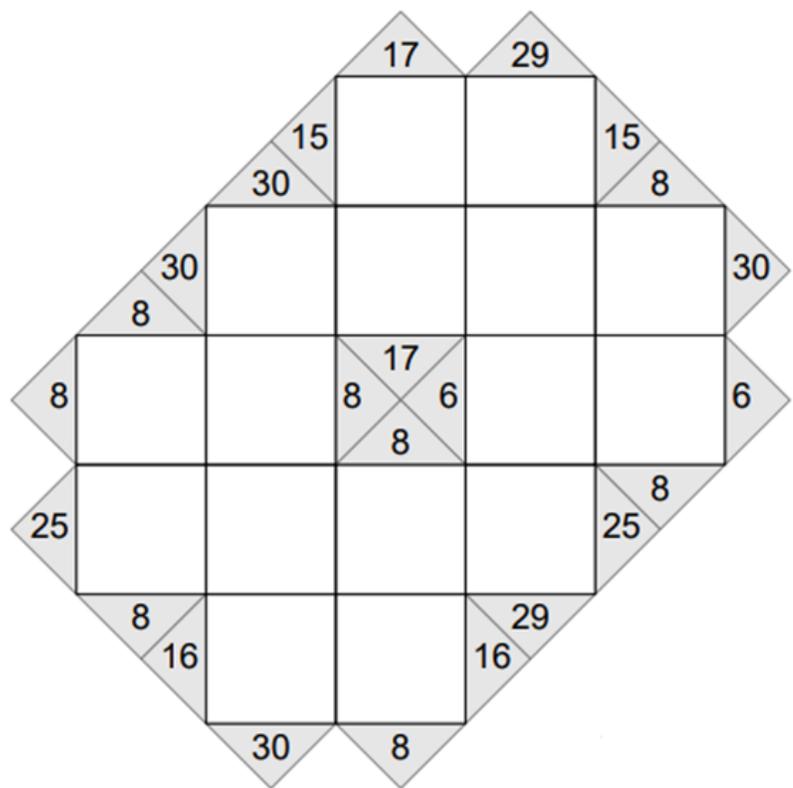
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Issue 26

Brain Teaser: Kakuro

Kakuro puzzles are like a cross between a crossword and a Sudoku puzzle. In this puzzle, you insert a digit – 1 through 9 – in each box. The same digit will never repeat within a row. If you add the digits in a row, the sum will be the number shown in the clue. Clues are shown on the left and right sides of “across” rows, and on the top and bottom sides of “down” rows.



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](https://www.facebook.com/DEVCOM.C5ISR)



Introducing Dr. Kimberly L. Foor


Name:

Dr. Kimberly L. Foor

Job Title:

Strategic Initiatives Officer

Length of Time as an Army Civilian:

11 years

Education:

Bachelor of Fine Arts, Specialization in Computer Design, Monmouth University, NJ

Master of Liberal Arts, Concentrations in History and English, Monmouth University, NJ

Doctorate of Business Management and Organizational Leadership, University of Phoenix

How does your job support the U.S. Soldier? In the field of International Programs, we identify opportunities to work collaboratively with our allies (nations that are our close friends) to support force integration (meaning we can work together easily) and further our Soldier's access to cutting-edge technologies to help them accomplish their mission and keep them safe.

What is a typical day or a week like for you? My typical day consists of meetings with my teammates, tracking the status of ongoing projects and agreements with our partner nations, and working to identify opportunities to start new ones. We frequently have meetings online with our counterparts across the world, including both our U.S. colleagues abroad and our foreign partners working on behalf of their own countries. It is a lot of fun to work with people around the world, learning about each other's cultures and working together to achieve unified goals.

What drew you to the STEM field originally? I enjoy working with art and technology! In middle and high school, I taught myself web coding and digital photography. In college, I interned for Marvel Comics in New York City as a graphic designer, then after graduation, I became an art director in the music industry. These experiences translated well into supporting U.S. Army research and development, especially in working on technology demonstrations and future concept presentations. It's been an adventure going from working with fictional heroes of the Marvel universe to working with real ones – our U.S. Army Soldiers!

Why is STEM important to our national security and our national future? Our STEM professionals are some of the best problem solvers in the world. Our workforce addresses real challenges every day and works to conquer them! STEM professionals are on the front lines of finding answers to the unknown, and they are continuously working to improve our current situations, capabilities, and technologies to keep us safe at home, abroad, at sea, and even in space.

How should students further their interests in a STEM field? Increase your awareness in your everyday activities. Be a good observer, and listen and watch closely for problems to solve. Get involved with STEM projects – your home, your school, and your community all offer opportunities for you to apply your STEM skills. Once you identify something that could use improvement, get creative! Write about what you see, then sketch, take pictures, share your ideas, and ask for help to build prototypes of your concepts.

What is the most important STEM-related innovation you've witnessed in your career? One of the most successful efforts I've witnessed is the U.S. Army's C5ISR/Electronic Warfare Modular Open Suite of Standards (CMOSS). CMOSS focuses on common modular open systems architecture, which means that instead of installing many systems on a platform, such as a vehicle/aircraft, it will be possible to install just one system that is able to perform the tasks of many.

What is your favorite technology for personal use? My smartphone is my favorite technology for personal use, as I can use it not only as a phone but for e-mail, internet activity, music, and photography. Multifunction is a great thing to keep in mind when developing new technologies. Put yourself in the shoes of your user, and try to think about what you can do to make someone's experience better!

What is the next great technological frontier? I think artificial intelligence/machine learning applications will continue to emerge as the next great technological frontier. Processing and visualization of information is critical to artificial intelligence/machine learning applications. Think of Tony Stark's Iron Man suit helmet, the digital interface of J.A.R.V.I.S., or the Wakandan interface displays from Black Panther. Augmented/virtual reality interfaces, including high-definition holographic displays, are no longer sci-fi tech. The Army is currently developing augmented reality goggles to provide our Soldiers access to increased situational awareness, critical information on missions, and new training opportunities.

Why is it important for engineers and scientists to engage with STEM Outreach? It is important for engineers and scientists to engage with STEM Outreach because as professionals, it is not only to share our knowledge with younger generations but to continue to learn and grow ourselves.

STEM Challenge

Materials	Cost
Rubber bands	\$80 for 5 bands
Cardboard box	\$250
Plastic bottles	\$125 each
Construction paper	\$60 dollar per sheet
Popsicle sticks	\$100 for 10
Straws	\$75 for 8 straws
Glue	\$50
Pipe cleaners	\$65
Plastic spoon or fork	\$95
Cardboard paper towel/toilet paper roll	\$150
Small bowl	\$175
Tape	\$50 for 12 inches
Cups	\$215
Other item of choice (not listed)	\$200

Gardening Challenge

This time of year, people often head outside to enjoy the warmer weather and to start working in their yards. Many people enjoy gardening, but the process of transferring seedlings can be challenging. Some people struggle with constantly bending over to plant seeds or young plants. What if there was a way to make the process of planting easier?



Mission:

Gardening Solutions and Designs has hired you as an engineer to design a device that will make the process of gardening easier for their customers. They are looking for a device that will allow people to safely transport their little plants or seeds into their final destination in the ground.

Requirements:

- Device must have a handle to allow people to carry it.
- Device must have a way to transport a plant or seed into the ground without damaging it.
- Device must keep plant upright or not drop the seed when transferring.

Design Process:

ASK: What is the problem you need to solve? Create a way for gardeners to easily transport seeds or young plants into the ground.

IMAGINE: Brainstorm and decide on one idea. How will your device make the process of transferring seeds or small plants to the ground easier?

PLAN: Draw a picture of your new design. What will your planting device look like?

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

IMPROVE: How can you improve your planting device?

Ask a grownup for permission to use these items.



Ask an adult to Share your STEM on Facebook.

[Facebook.com/DEVCOM.C5ISR](https://www.facebook.com/DEVCOM.C5ISR)

#C5ISRCenterSTEM

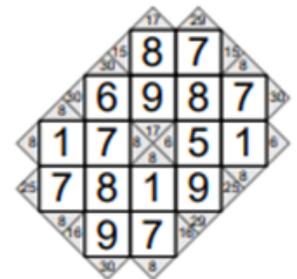


GET YOUR STEM ON...

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.



Solution to puzzle on P. 1

STEM IN THE NEWS

Reading to Succeed!

A researcher from the University of Buffalo has made some unexpected discoveries as a result of his recent studies on dyslexia. Dr. Christopher McNorgan, the head researcher and assistant professor from the University at Buffalo's Department of Psychology, uncovered that cooperative areas of the brain that are responsible for reading are also at work during unrelated activities like multiplication. The findings highlighted that the division between literacy and math – and arts and sciences – overlap in ways not previously confirmed. The foundational skills of reading, writing, and arithmetic have more in common than we previously thought!

"These findings floored me," said McNorgan, who is also an expert on neuroimaging and computational modeling. He stated that this research promotes the importance of literacy by showing how reading proficiency reaches across domains, guiding how we approach other tasks and solve other problems. These findings appear in the scientific journal *Frontiers in Computational Neuroscience*.

McNorgan did not plan for his research to take this direction. Initially, he had planned on exploring if it was possible to identify dyslexia in children on the basis of how the brain was wired for reading. This seemed likely due to previous research he had completed that identified a biomarker, or biological marker, for attention deficit hyperactivity disorder.

McNorgan was able to identify dyslexia with a 94% accuracy after he examined and finished with his first set of data. This first set consisted of functional connectivity data from 14 "good" readers and 14 "poor" readers that were engaged in a



language task. To determine if his findings could be generalized, he needed more data, so he chose a math study. He had participants use mental math to complete multiplication tasks and measured functional connectivity in this second data set.

In the two data sets Dr. McNorgan used, the participants were engaged in two different tasks, reading and multiplication. Yet each case presented the same connectivity fingerprint, and he was able to identify the 94% of dyslexia whether testing against the math group or the reading group. He could identify dyslexia, but the data showed that the brain's wiring for reading was also present for math.

"The results show that the way our brains are wired for reading are actually influencing how the brain functions for math," he explained. "Your reading skills are going to affect how you tackle problems in other areas and domains, and this also helps us better understand children with learning difficulties in both reading and math."

What is functional connectivity?

Functional connectivity is a dynamic description as to how the brain is wired from moment to moment. Instead of imaging this in terms of the physical wires used in a network, instead, imagine how those wires are used throughout the day. When you do school work on your computer, your laptop sends a document to your printer. Later in the day, you may use your laptop to stream a movie to your television. How those "wires" are being used depends on whether you're working or relaxing, and the same applies to humans. Functional connectivity changes according to the immediate task.

Your brain dynamically rewires itself all the time. Imagine you are reading a list of restaurant specials while standing just a few steps away from the menu board that's hanging on the wall. The visual cortex is working whenever you are looking at something, but because you are reading, the visual cortex is wired to the auditory cortex, which is used for reading.

Pointing to one of the items on the board, you accidentally knock it off the wall. When you reach out and try to catch it, your brain wiring changes. You're no longer reading, but you are trying to catch a falling object, and your visual cortex now works with your pre-motor cortex to guide your hand.

Sources and Resources:

www.buffalo.edu/news/releases/2021/03/013.html

www.frontiersin.org/articles/10.3389/fncom.2021.590093/full

STEM Activity/Challenge

Materials:

- Piece of white or clear plastic (a plastic plate or a cup works great, and you can also use clear saran wrap and tape it to a plate)
- Petroleum jelly
- Small rock or other heavyweight item (such as a brick or wood block) or duct tape
- White paper

Air Pollution Science

Air pollutants have a negative impact on plant growth. Plants can be damaged by ozone or other pollutants, resulting in stunted plant growth or discolored or speckled leaves that look like they've been burned or bleached. Plants grown in polluted areas tend to have a smaller root system and less leaves than plants grown in a less polluted area. Try this simple experiment at home to learn more about air pollution in your surrounding area.



Directions:

1. Spread the petroleum jelly on the white or clear plastic.
2. Either place a heavy item on top of the plastic to hold it down or secure the plastic using duct tape.
3. Take a picture and leave your plastic outside for about 24 hours.
4. After your pollution detector has been outside for 24 hours, bring the plastic back inside and place it on a white piece of paper or white surface.
5. Take a picture again and examine the plastic for any particles that were collected

SAFETY NOTICE



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

Resources:

www.sciencetopia.net/pollution/air/facts
garden.lovetoknow.com/wiki/Impact_of_Air_Pollution_on_Gardening

The Science Explained

It is easy to assume that the air surrounding us is clean because we cannot see it; however, our atmosphere is made up of invisible gases, and most air pollutants are invisible as well. Air pollutants like vehicle emissions, industrial byproducts, and landfills produces greenhouse gases, which absorb energy from the sun, resulting in global warming that heats the earth. This rise in temperature can lead to rises in sea levels, changes in seasonal timing, and a decrease in biodiversity. Scientist use complex sensors to detect and quantify specific gases in the air.

Scientists measure the amount of polluting particles, also known as particulate matter, in the air. Polluting particles can either be liquid droplets or solid particles, big or small, and colorless or colored. The pollution detector you created allowed you to examine air pollution in your own environment by trapping any particulate matter floating around in the air at the time of your experiment.



ARMY EDUCATIONAL
OUTREACH PROGRAM

AEOP offers our nation's youth and teachers opportunities for meaningful, real-world STEM experiences,

competitions and paid internships alongside Army researchers.

<https://www.usaeop.com/>