



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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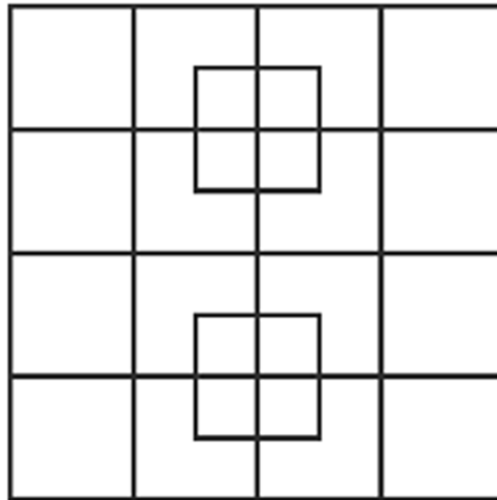
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Issue 30

Brain Teaser— Count the Squares.

How many squares can you count in the image below?

Note: squares only, NOT rectangles.



Solution on Page 3



This will be our final issue of STEM@Home for the current school year. We will be back in September. Have a wonderful summer.

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 Ms. Mary Wills


Name:

Ms. Mary Wills

Job Title:

Chief Engineer,
Intelligence and
Information Warfare
Directorate

**How long have you been
a U.S. Army engineer/
scientist?**

34 years

Education:

- BS in Electrical Engineer from Rutgers University, NJ.

How does your job support the U.S. Soldier? – Our warfighters need the best technology available to maintain combat advantage. Historically, U.S. Soldiers have been the best equipped in the world. And in some aspect or another, much of their equipment originated in a lab, designed and developed around military specific objectives. But technology is ever evolving, and our adversaries are increasingly resourceful and technologically savvy. So winning today does not mean we will win tomorrow. Our science and technology investments are focused on outpacing the technology of our adversaries so our warfighters come home safely. My job is to ensure Army dollars are invested in the most promising, operationally impactful capabilities available.

What is a typical day or a week like for you? – Every day is busy. Most are split between meetings and working independently to develop and monitor our investment strategies. I advise engineers and scientists as well as managers and program analysts on current investments and opportunities for the future, and I guide them through the various process and procedures used to manage our programs.

What drew you to the STEM field originally? – In my senior year, I was exposed to engineering under Fort Monmouth’s Junior Fellowship Program. I began to understand how engineering teaches you to clearly define a problem and how to methodically think through a solution. It wasn’t very long before I decided that a degree in engineering would be my way forward. With this as a foundation, I saw I could go on to do almost anything.

Why is STEM important to our national security and our national future? – Our engineers and scientists have developed a vast array of solutions that are being used protect this nation. We can now do more with less, for longer periods of time, and at greater speeds and distances than ever before. But where there is great benefit, there is great risk. Systems fail. Adversaries are attempting to deny or degrade our capabilities. As a nation, we must mitigate these risks. We must continue to promote and support STEM careers if we are to maintain a ready and superior military.

How should students further their interests in a STEM field? – Learn as much as you can about the practical applications of whatever you are interested in. Join a club at school or join a secure online forum that talks about the latest advances. Research the history and the famous inventors, scientists, or architects who contributed to your particular field of study. Then find out who the leaders of today are and follow their careers. Selecting someone you can relate to, perhaps from your hometown or of similar economic or ethnic background can solidify a vision of your future more clearly.

What is the most important STEM-related innovation you’ve witnessed in your career? – The personal computer and the networking technologies that go along with it. When I began working for the Army, desktop computers were just being issued to civilian employees. In a relatively short time, they have completely changed our society and given rise to an ever-expanding industry of products and services. Today, everyone has several personal devices equipped with multiple communication modes, all connecting us to the internet and each other in seconds. They have changed how we learn, listen, play, navigate, and shop. They have even changed the English language itself.

What is your favorite technology for personal use? – For so many reasons, everyone loves their cell phone, and I am no different (although the heated steering wheel in my car is blessing on a cold day). I love having my friends and family close and accessible. I can get pictures, music, games – all in the palm of my hand. I can get directions to anywhere and find my kids in the middle of an amusement park. Waiting in grocery store lines, at the airport or doctor’s office, I can research almost any topic, check my bank balance, or call ahead to let someone know I will be late.

What is the next great technological frontier? – Commanders, operators, and analysts rely on intelligent sensors deployed on manned and unmanned platforms to gather information from across the battlefield. The data collected is processed and used as part of the military decision-making process. Artificial intelligence and machine learning are making this process more sophisticated, reducing decision and reaction times. As assistive technologies become more advanced, we may see an evolution toward brain-computer interfaces or neural interfaces that enable operators to directly control a sensor, system, or platform. Brain-computer interfaces are already being applied to prosthetics and have been used to control small unmanned aerial vehicle swarms in university experiments.

Why is it important for engineers and scientists to engage with STEM Outreach? – The STEM path is not easy. It requires lots of study, patience, and dedication. With any field of study, students need the encouragement of like-minded individuals to believe something is possible. Kids are encouraged from early ages to play a musical instrument or to engage in sports; STEM should be no different. If they do not have someone at home to encourage them or help them with their homework, they may shy away from math and science. When working engineers and scientist share their knowledge, experiences, and even failures, a career in STEM can seem more attainable.

STEM Challenge



Design a Launcher Device

Materials:

- Popsicle sticks
- Paper, cardstock, or cardboard
- Paper towel roll tubes
- Small plastic cups
- Aluminum foil
- String or rubber bands
- Small paper cups or bowls
- Pipe cleaners
- Straws
- Tape
- Plastic spoons
- Other useful items in your home

Testing Materials: pom-poms or cotton balls

Dr. Hank is a very strange but curious scientist. He is always in his lab creating and mixing new concoctions. One day, he left a window open and a bird accidentally got into his lab. The bird flew around and broke a glass that held Dr. Hank's newest experiment, called Compound X. In the process, the bird became coated in the compound. Before Dr. Hank could catch it, the bird escaped the lab, flew around the community, and dripped the Compound X all over the townspeople. Covered in the compound, they became goofy, silly, mushy somebodies.

Mission:

When Dr. Hank heard the news of those infected with Compound X, he quickly created a cure but could not think of a way to getting it to those who are infected. He has hired you as an engineer to design a device that will launch his cure and target the infected citizens.

Requirements:

Device must be able to hold and launch Dr. Hank's cure and hit the infected citizens of the community.

Design Process:

ASK: What is the problem you need to solve? A way to launch a cure to get it to those infected by Compound X.

IMAGINE: Brainstorm and decide on one idea. How will you design a device to launch the cure?

PLAN: Draw a picture of the new device. What will your launcher look like?

CREATE: Use the materials to create a prototype of your launcher for the cure.

IMPROVE: Use materials to test your launcher. How can you improve your device?

Questions to ask:

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



Ask an adult to Share your STEM on Facebook.

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

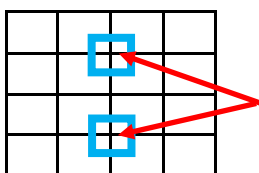
#C5ISRCenterSTEM



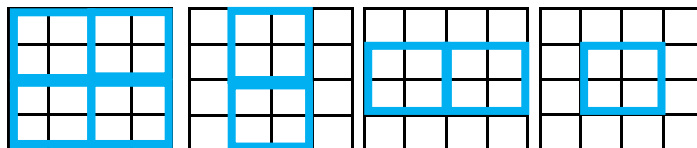
SAFETY FIRST! You Must Have Adult Supervision To Complete This Activity.



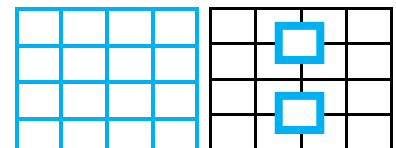
The correct answer to the puzzle on pg. 1 is 40 squares.



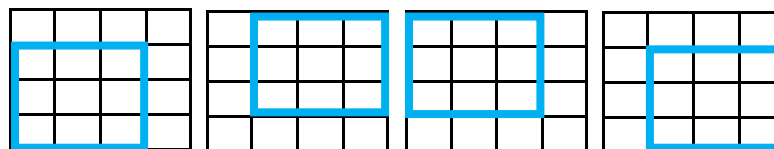
Eight tiny squares



Nine 2 X 2 squares



Eighteen single squares



Four 3 X 3 Squares



One 4 x 4 square.

STEM IN THE NEWS

Using physics to predict an elevator's arrival

Have you ever waited a long, long time for an elevator?

Our world has a lot of tall buildings – and a lot of elevators! For instance, Hong Kong, the hometown of physicist Zhijie Feng, adds new elevators at the rate of approximately 1,500 machines every year.

Feng of Boston University, and Sante Fe Institute professor Sidney Redner, decided to study elevators, and whether they can be improved. The two scientists published their findings in the *Journal of Statistical Mechanics*.

They began their studies by first playing with toys – toy elevators, that is! They build a scale model of an elevator and began making observations.

“Engineers have already developed software and computer models for simulating elevators,” said Feng in a *Science Daily* news article. “Instead, we wanted insight into basic mechanisms, using just enough parameters to describe what we see in a way that we can fully understand.”

According to *Science Daily*, the next step the physicists took was to set up a computer simulation program. They created six scenarios for their simulation: unoccupied buildings, first-come-first-served transport, identical elevators traveling to uniformly distributed destination floors, 2.5 second to enter or exit elevators, and one second to travel from one floor to the next.

Feng and Redner then ran tests, checking to see how efficient the elevators ran in a 100-story building. If an elevator could hold an infinite number of people, the physicist found that, on average, people would wait between five and seven minutes for an elevator. If an elevator could only carry 20 people each, and if 100 workers needed to access each floor, the elevator ran more than 500 trips over two hours to get everyone to their destination.

Elevators that run at equal and efficiently spaced intervals should shorten the wait time, but an increase in passengers and demand causes the elevators to move in lockstep. The end result? Traffic in the lobby, and a number of elevators end up on the ground floor at the same time. This leads to longer waits throughout the building.

Feng and Redner are hoping their studies can be used to increase the efficiency of elevators. Maybe you can come up with an idea the next time you find yourself waiting a long time for an elevator!



Sources and Resources:

www.sciencedaily.com/releases/2021/05/210503104754.htm



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

STEM Activity/Challenge

Materials:

- Paper
- Scissors
- Pencil, markers, or crayons (or other things you have at home to decorate your origami whale)

Origami Whale Activity

There are lots of fun math activities for you to do at home that don't require special materials. In fact, with just a few sheets of paper, you can find fun ways to explore math ideas, problem solving, and creating some fun art in the process! Many of these activities can be done with whatever paper is available – even scrap paper, newspapers, or magazine pages would work. In today's activity, we are going to making an origami whale.



Directions:

1. Start with a six-inch square, positioned like a diamond. If you don't have a piece of paper at home, you can easily measure and make one yourself. Once you have your paper square, fold the left point over to meet the right. Open it up again.
2. Fold the two sides inward to meet the center fold, or line of symmetry.
3. Fold the top point down to meet the folded triangles.
4. Fold the right side over to meet the left side.
5. Rotate the shape so that the long, flat line is at the bottom.
6. Fold the left point up to make a tail. Slit the tail at the top and fold the triangles out.
7. Lastly, if you have a pencil, crayons, or markers, draw a face on or decorate your whale!

Things to consider:

After completing step 3, how many triangles can you count? Remember that larger triangles can contain smaller triangles.

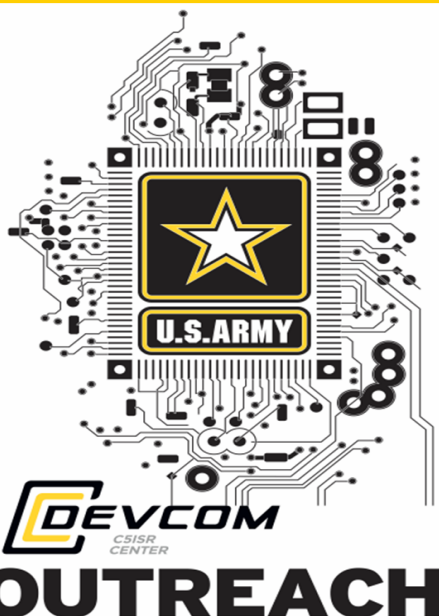
Find all the triangles that make matching pairs. How many pairs are there?

In step 5, you have made a quadrilateral—a shape that has four sides. Do any of those sides match? What about the angles inside the quadrilateral?



SAFETY FIRST! You Must Have Adult Supervision To Complete This Activity.

Source: www.scholastic.com/teachers/lesson-plans/teaching-content/origami-math/



Get Your STEM On... Now is a great time to get involved in STEM...

The C5ISR Center Educational Outreach Program is a collection of kindergarten through college-level programs designed to give the students of northeast Maryland and Northern Virginia access to educational and extracurricular opportunities in the areas of science, technology, engineering, and math, or STEM.

For more information about our STEM Outreach Programs, visit us on the web:

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

Or, to reach our office, you can email us:

usarmy.apg.devcom-c5isr.mbx.outreach@mail.mil