



C5ISR CENTER STEM@Home

APPROVED FOR PUBLIC RELEASE

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.

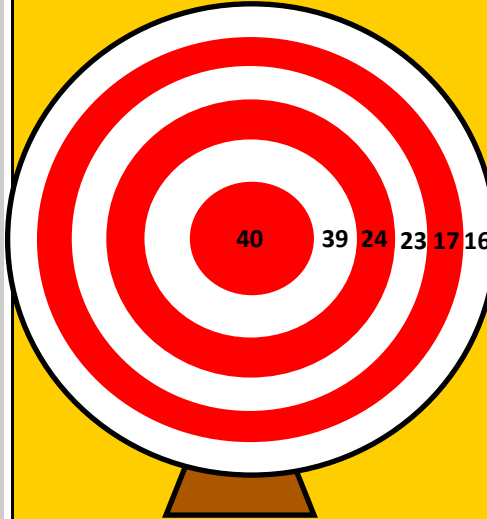


In this Issue...

STEM Highlight	P. 2
STEM Challenge	P. 3
STEM Experiment	P. 4

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Brain Teaser - Bullseye



Answer on Page 2

Nora, Natalie, and Nola are competing in an archery contest.

Each shoots six arrows.

- Nora obtains 120 points.
- Natalie gets 110 points.
- Nola totals 100 points.

Every arrow scored. The bull's eye was only hit once.

What are the exact six hits made by each contestant?



The Army Educational Outreach

Program (AEOP) offers STEM programs for students at every level of their STEM Journey. From competitions, to enrichment activities—from apprenticeships to scholarships, AEOP has a program that is right for you.

WWW.USAEOP.COM

THE NEXT GENERATION OF INNOVATORS

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 students access to 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/

STEM Highlight

We Want to Hear From You!



- * What is your favorite part of the STEM@Home Newsletter?
- * What would you like to see more of in the Newsletter?
- * If there would be one thing you could add to the Newsletter, what would it be?

With the help of a parent or guardian, please send your answers to us via email at usarmy.apg.devcom-c5isr.mbx.outreach@army.mil and you might be featured in the February STEM@Home Newsletter!

Do you have what it takes to be a STEM leader of the Future?

AEOP Apprenticeships and Fellowships help you gain the skills and experience you need today to prepare for the STEM careers of tomorrow. Programs are available for students in high school and college as well as for enrolled in graduate and post-doctoral programs

The future is bright for careers in STEM. STEM careers are projected to continue to grow at a faster rate than non-STEM careers in the next decade. Make sure you have the skills you will need.

Find out more at <https://www.usaeop.com/apprenticeships-fellowships/>



Answer from Page 1: Nora scored 120 (one 40, five 16's). Natalie scored 110 (two 23's, four 16's). Nola scored 100 (four 17's, two 16's).

PS: Can you find another way? Let us know!

Resource: <https://www.pedagonet.com/puzzles/bullseye1.html>

STEM Challenge

Snow Clean Up STEM Challenge

Winter is here! The town of Baileyville is expecting a big blizzard to come next week. The Mayor is concerned because there has been a shortage on snow removal devices.



Mission:

Cheeks The Mayor of Baileyville has hired you to design a device that will allow workers for the town and people in the community a way to remove snow quickly and efficiently.

Requirements:

The snow removal device must be able to move snow (push, pull, or pick up).

Design Process:

ASK: What is the problem you need to solve? A way to remove

large amount of snow quickly and efficiently.

IMAGINE: Brainstorm and decide on one idea. What type of device can you design to remove large amounts of snow quickly?

Materials	Cost
Straw	\$75 per straw
Cardboard piece	\$200
Rubber bands	\$90 per band
Aluminum foil	\$125
Popsicle sticks	\$100 for 10
Straws	\$75 for eight straws
Glue	\$50
Cardboard/ paper towel/ toilet paper roll	\$150
Tape	\$50 for 12 in
Paper cup or bowl	\$250
Plastic spoon	\$225
Pipe cleaners	\$65 for 2 pipe cleaners
Other item of choice (not listed)	\$200

PLAN: Draw a picture of your device. What will your snow removal device look like?

CREATE: Use the materials to create a prototype of your snow removal device and test your creation.

IMPROVE: How can you improve your snow removal device?

Questions to Ask:

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

Will your snow removal device clean up snow quickly and efficiently?





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

Joke: What do you call a dance party when it's snowing? ***A snowball***

STEM in the News

Magnetic “Hedgehogs” Stores Big Data in a Small Space



To keep up with the demands of constantly changing technology and making it better and faster, computer scientists and engineers are constantly testing and improving their speed, durability, and data storage. Sometimes, technology has limits and our devices can only compute so fast, hold battery power for so long, or only store a certain amount of data.

A research team from The Ohio State University explored and studied how to expand and add “space” for storage of video and cloud data in centers where data is stored. To create this storage, the team used a magnetic microscope to visualize and form thin film patterns of an unusual magnetic material called manganese germanide. Unlike familiar magnets like iron, the material of this magnet follows a helix

pattern – just like the structure of DNA. The team has called these new patterns “hedgehogs,” since they resemble the spikes on the back of a hedgehog.

“These new magnetic patterns could be used in the next generation of data storage,” said Jay Gupta, who is the senior author on the study and a physics professor at Ohio State. “The storage of hard disks has limits related to how small you can make the magnetic bits allowed for storage.” This started the process of looking for new material where the team could make the magnetic bits smaller.

To see these patterns in the lab, Gupta and the team used a scanning and tunneling microscope modified with special tips. This helped to take pictures of the magnetic patterns with atomic resolution. These images showed that the magnetism at the surface was twisted into a pattern that resembles spikes on a hedgehog. The team also found that these patterns could be shifted with electric currents and shifted with magnetic fields.

“There is an enormous amount of potential for these magnetic patterns to allow data storage to become more energy efficient,” says Gupta. “We still have a huge amount of fundamental science to do understand these patterns and improving how we control them. But this is a very exciting step.”

This research was published in the scientific journal publication *Science* and funded by the Defense Advanced Research Projects Agency, a research division of the US Department of Defense.

Sources:

<https://news.osu.edu/magnetic-hedgehogs-could-store-big-data-in-a-small->



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#C5ISRCenterSTEM

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Did you know?

- A hedgehog has between 5000 and 7000 quills.
- Hedgehogs got their name from their preferred habitat garden hedges and the pig like grunts they make
- A group of hedgehogs is called an “array.”

what do you call a famous hedgehog? *Hedgendary*

STEM Activity

Winter Weather Experiment

In the first week of January, we started to see some winter weather with snow falling down and leaving a fresh blanket on the ground. Try this fun experiment where you will test 3 different snow recipes to determine which one feels the most like authentic snow. The best part is you get to play with snow without having to bundle up to go out in the cold.

Take a moment to make a prediction on which fake snow recipe will look and feel the most like snow. As you make each recipe, conduct a few tests on each recipe so you can determine at the end which artificial snow is the most authentic. A few things to test are how cold it feels, how well it can be formed into a snowball, and lastly the texture of the artificial snow.

Materials:

For all 3 recipes you will need:

- Large tray or cookie sheet
- Large bowl
- Spoon, Fork for mixing
- Towels (it can be a bit messy)



Recipe 1: Baking Soda and Shaving Cream Snow

Materials: 1 cup of baking soda & 1 cup of shaving cream

1. Pour 1 cup of baking soda into your bowl.
2. Add in about a cup of shaving cream into the baking soda.
3. Use a fork or spoon to mix the two ingredients together until you get a powdery snow like substance. (If you think you added too much shaving cream, add in some more baking soda).
4. Take a moment to observe how your fake snow feels in relation to its texture and temperature.

Recipe 2: Baking Soda Artificial Snow

Materials: 4 tablespoons of baking soda & 1 tablespoon of cold water

1. Measure and place 4 tablespoons of baking soda into a bowl.
2. Pour in about 1 tablespoon of water into your bowl.
3. Mix the two ingredients well with a spoon or your hands.
4. Take a moment to observe how the fake snow feel in relation to its texture and temperature.

Recipe 3: Paper Artificial Snow with Vinegar, Baking Soda and Paper Towel

Materials: ½ cup of baking soda, water, paper towel ripped into small pieces (about a cup of paper towel pieces)

1. Place your paper pieces into a bowl and pour in you ½ cup of baking soda while gently mixing them together.
2. Slowly pour 3 tablespoons of vinegar into the paper and baking soda mixture.
3. Mix all 3 ingredients well with a spoon.
4. Take a moment to observe how the fake snow feels in relation to its texture and coldness.



SAFETY FIRST!

You Must Have Adult Supervision To Complete This Activity.

Experiment Results and the Science Explained:

1. In the first recipe, baking soda with the shaving cream, you should have noticed the two ingredients formed a powdery snow like substance. The sodium bicarbonate (baking soda) when mixed with the shaving cream compound creates a mixture that is cold to the touch. This is known as an endothermic reaction, which is a chemical reaction that absorbs heat during the reaction. They take in more energy than they give off causing its surroundings to become cooler.
2. In the second recipe, baking soda artificial snow that consisted only of two ingredients, you may have noticed that it had the most crunch factor that resembles a wet snow. When you form this mixture into a ball, it will crumble when it is squeezed. Baking soda dissolves easily in water, which is what gives it a snow like texture when mixed in water. If you were to evaporate the water from the baking soda, it would be recovered unchanged.
3. In the third recipe, paper artificial snow that used vinegar, baking soda and a paper towel you may have notice that it also had a crunch factor that is similar to snow, but it has a rough texture feeling. When you first mixed the baking soda with the vinegar you may have noticed bubbles that formed. This is because baking soda is a base and vinegar is an acid and when combined they form a new chemical called carbonic acid that immediately decomposes into carbon dioxide gas. The carbon dioxide gas is what makes the bubbles.

Resource: <https://www.wonderopolis.org/wonder/what-happens-when-you-mix-vinegar-and-baking-soda#:~:text=When%20vinegar%20and%20baking%20soda,carbonic%20acid%20and%20sodium%20acetate>