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…

VOL 2, Issue 3

Brain Teaser

The Academy ** has implemented a clock policy. All clocks follow this rule: the minute hand always moves in the opposite direction to the hour hand. To become a certified Snoop Inspector (CSI), you must tell the real time.

Hints:

- The clock hands are exactly together between the hours of four and five o'clock,
- The hands started together at noon.

Question: What is the real time?

Answer on Page 3

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.

JANUARY PROGRAM OPORTUNITIES:

- High School Life Hacks (Grades 9-12) – Jan 5 at 6 p.m.
- Middle School STEM Night (Grades 6-8) – Jan. 12 at 6 p.m.
- STEM Story Hour (Grades K-2) – Jan. 19 at 5 p.m.

Registration is on a rotating basis. Visit our registration page for more details:

https://usarmyc5isrcenter.submit.com

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.

DEVCOM C5ISR CENTER OUTREACH

STEM Highlight and Interview

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.

Have you been a part of one of our STEM@HOME events and have an invention you would like to share? Have your grownup email us at usarmy.apg.devcom-c5isr.mbx.outreach@army.mil and your invention could be included in a future issue of our STEM@Home Newsletter!

How do YOU do STEM? Ask your grownup to share with us!

Facebook.com/DEVCOM.C5ISR

#C5ISRCenterSTEM

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Answer from Page 1:

The real time is 36 and 12/13 minutes after four o'clock. Snoop Academy clock indicates 23 and 1/13 minutes after four o'clock. To obtain the real time, deduct the number of minutes indicated from 60.

Resource: https://www.pedagonet.com/puzzles/snoop.html

STEM Challenge

Materials
Pipe Cleaners
Cardboard piece
Printer Paper
Construction paper
Popsicle sticks
Straws
Glue
Cardboard paper towel/ toilet paper roll
Tape
Cups
Other item of choice (not listed)

The Great Acorn Chute

Winter is here! Squirrels do not hibernate, but they take the time to prepare by fattening up their bodies because they are less active during the winter. A squirrel's main diet consist of acorns, seeds, berries and nuts. Now during autumn time, you may see squirrels eating or burying a lot of acorns.

Mission:

Cheeks the squirrel has reached out to you as an engineer to help him design an acorn chute that will help him collect his acorns to bury them in his stash. His problem is that a lot of the acorns he is trying to get are high in the tree or on a deck railing.

Requirements:

Chute must be able allow acorns to slide down to a lower levels so Cheeks the squirrel can access them easily.

Extra Challenge:

Design your turkey trap within a budget using the cost list on the side.

Design Process:

ASK: What is the problem you need to solve? Design an acorn chute to help Cheeks the squirrel get acorns.
RESEARCH: Research what products or solutions already exist and find technologies that might be adaptable to your needs for the problem that you are solving for Cheeks the squirrel.
IMAGINE: Brainstorm and decide on one idea. How will your acorn chute work?
PLAN: Draw a picture of the new device. What will your acorn chute look like and what materials will you use?
CREATE: Use the materials to create a prototype of your acorn chute design.
IMPROVE: How can you improve your acorn chute?

Questions to ask: If you had more choices of materials, what would you use and why?
What was challenging about building your acorn chute?
SHARE: Show your family and friends your ghost transport device and explain how it works.

SAFETY FIRST!

You Must Have Adult Supervision To Complete This Activity.

STEM in the News

Night vision and Artificial Intelligence Used to Study Spiders

Spiders may be very scary to a lot of us, but how exactly do they build their webs?

Researchers at the Johns Hopkins University wanted to learn every step of this process, from start to finish. To do that, they used science and engineering to study and understand just how this happens. First, the study needed to track every movement of each leg and learn how spiders are capable of creating these structures. However, most spiders are weaving at night and use touch instead of sight to make their creations. Because of this, the team needed to be able to see in the dark. Thanks to night vision and infrared cameras, they were able to see exactly what was happening when the spiders are building their webs.

Once the team figured out how they were going to see the spiders in the dark, they needed to figure out how to record all their movements, including all of those legs! Using artificial intelligence, the team created an algorithm that captured and tracked all the movements of each legs. Even with the video recordings aided by night vision, there were massive amounts of data to sort and review. So to log each of these movements, the team also created and trained machine vision software to detect and document every leg movement to learn how the legs built an entire web.

"Now we have defined the entire choreography for web building," said Hopkins behavioral biologist Andrew Gordous. "This has never been done for any animal architecture at this fine of a resolution."

By studying their movements, which is directly linked to their brains, the research team projects that their finds could help understand how bigger brain systems work in other animals – maybe even humans!

Sources:

https://www.sciencedaily.com/releases/2021/11/211101105356.htm

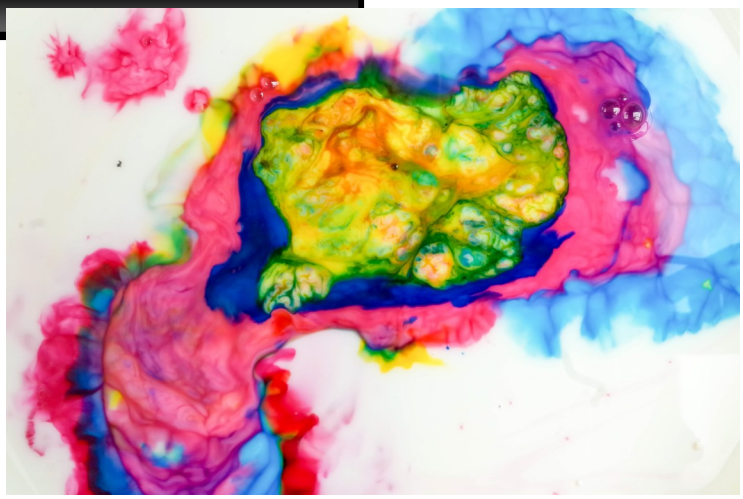
https://www.sciencefocus.com/news/night-vision-and-artificial-intelligence-reveal-secrets-of-spider-webs

Did you know?

- Spiders are not insects—they are arachnids.
- Not all spiders weave webs. The ones that do are called orb weavers.
- Spiders are near sighted, which means they can objects close up but not far away.

STEM Activity

Northern Lights in a Bowl Experiment



The northern lights create an aurora of beautiful natural lights in the sky that look like they are dancing. With just a few ingredients from your kitchen, you can create your own display of the northern lights and make them dance across or dish or bowl.

Materials:

- 3-4 leaves from the same tree (try to find different colors of leaves) or experiment with leaves from different trees
- Shallow dish or bowl
- Small dish (big enough to hold some dish soap)
- Food coloring (blue, green, purple, yellow, red)
- Cotton swabs
- Dish soap
- Milk (whole milk works best)

Directions:

1. Pour about ¼ cup of milk into your shallow dish or bowl or until you have a thin layer of milk in it.
2. Put some dish soap into your small dish and set it aside.
3. Add drops of food coloring all around in the milk. To obtain the colors of the northern lights, you will want to use mostly green and blue food coloring, with a few other colors. Add at least 3-4 drops of each color.
4. Dip your cotton swab into the dish soap, then gently place it on the surface of the milk. Watch with amazement as the colors dance across the surface of the milk just like the northern lights in the sky.

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

The Science Explained

This simple experiment allows you to study the effect fat content has on the movement of colors when dish soap is added. The big key to the dancing colors in this experiment is the soap. Soap molecules consist of two different ends. One end is hydrophobic, meaning water fearing, and one end is hydrophilic, meaning water loving.

Milk is made up of minerals, proteins, and fats. Proteins and fats can be susceptible to changes, and fats cannot dissolve in water. When the dish soap is added to the milk, it separates the water and fat in the milk. The hydrophobic end of the soap molecule breaks up the non-polar fat molecules, and the hydrophilic end is attracted to the water. When the soap molecules attach to the fat molecules in the milk, it allows the non-polar fat molecules to be carried by the water molecules. This process would normally be invisible to you, but the food coloring allows you to see all the movement taking place.

The pushing and pulling of the fat molecules in the milk results in an explosion of color. When the soap becomes evenly mixed with the milk, the action will slow down and eventually stop. To see if there are more fat molecules, add more soap to milk. If there are fat molecules still, the color explosion will start again.

Resource: http://www.steampoweredfamily.com/activities/galaxy-magic-milk-experiment