

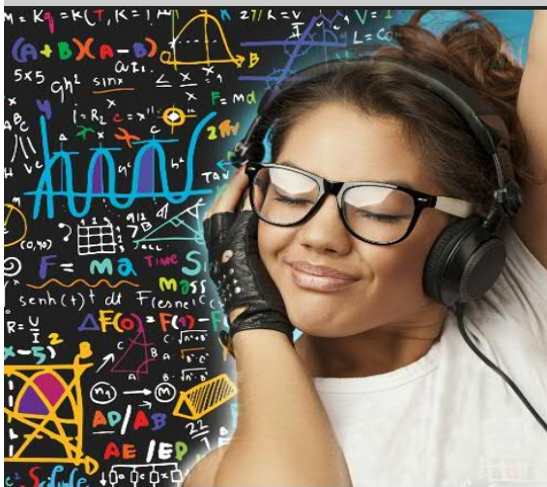


# C5ISR CENTER STEM@Home

## 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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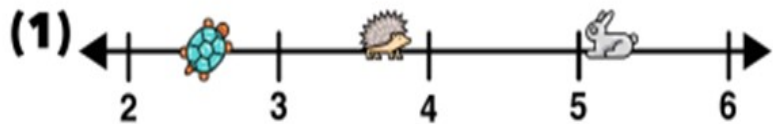
## Ture or False?

Look at the number key below. Then look at the three number statements. Of the three statements, two are **TRUE** and one is **FALSE**. Identify the false number statement.

### NUMBER KEY:

$$\text{Hedgehog} = 3\frac{3}{5} \quad \text{Rabbit} = 5\frac{1}{4} \quad \text{Turtle} = 2\frac{1}{2}$$

### NUMBER STATEMENTS:



(2)  $\text{Hedgehog} + \text{Turtle} < \text{Rabbit}$

(3)  $7\frac{3}{4} = \text{Turtle} + \text{Rabbit}$

Solution on Page 3



## SHARE YOUR STEM...

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



#C5ISRCenterSTEM

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

## Introducing Ms. Sandy Sanders


**Name:**

Sandy Sanders

**Job Title:**

Program Analyst

**Length of Time as a U.S. Army Engineer:**

10 Years

**Education:**

Bachelor of Arts in English, with a Teaching Certification, from the University of Houston

**How does your job support the U.S. Soldier?** I directly support our organization's chief information officer. Because our team handles a variety of responsibilities, all aimed at protecting and providing information, I wear a variety of hats to ensure that my organization's scientists and engineers can collaborate with other Department of Defense organizations, as well as with people from academia and industry, to create solutions that give our Soldiers the advantage over their adversaries.

**What is a typical day or a week like for you?** During my normal work day, I usually try to check my email first thing in the morning to determine if there are any issues that need to be addressed. Sometimes addressing the issue(s) entails working things out through email, while other times, a meeting (either virtual, in-person, or via phone call), is required to work things out. If I'm able to resolve the issue(s) before the end of my work day, then I pull out my ongoing "to do" list and try to get a little farther on my projects.

**What drew you to the field originally?** Honestly I never knew there was such thing as a program analyst. Even though I am a liberal arts major, I find STEM areas fascinating because they allow us to break things down, find answers, and build things based upon those answers. I love the fact that within my organization, technical science majors and creative liberal arts majors can work together to support the Soldier.

**Why is STEM important to our national security and our national future?** Thanks to STEM, Soldiers are fighting "smarter, not harder." Thanks to technology, Soldiers have come a long way from rushing into battle on horses. Unfortunately, our enemies have come a long way too, and in order to protect both our national security and our national future, we must continue to evolve as technology evolves and use STEM to stay at the forefront.

**How should students further their interests in a STEM field?** Students should keep their eyes open to whatever STEM-related opportunities and resources are out there: summer camps, after-school programs, internships, STEM-related videos found online, the library, and the cool STEM newsletters put out by the C5ISR Center Outreach team. In a nutshell, students should continue to expose themselves to as much STEM-related information as possible, from as many sources as they can.

**What is the most important STEM-related innovation you've witnessed in your career?** To me, it would have to be the internet. Information is now at our fingertips, and gone are the days when I had to rely upon going to the library to physically search through books and resources to find answers. Most of us can just access the internet on our personal devices if something needs to be researched.

**What is your favorite technology for personal use?** My favorite technology for personal use would have to be my smartphone. It gives me the internet at my fingertips, connects me with friends via text, provides me a variety of apps from fitness tracking to navigation, and allows me to take videos and photos and post them to social media.

**What is the next great technological frontier?** I think that the next great technological frontier is space. The United States' newest branch of the military is the Space Force, and because it's so new, there will be much to learn and accomplish within this new frontier.

**Why is it important for engineers, scientists, and analysts to engage with STEM Outreach?** Fostering within future generations an interest in STEM can only help our country stay on the forefront of technology. Ensuring that our country stays on the forefront of technology not only helps the Soldier but helps our country in general.

# STEM Challenge

Materials	Cost
One Straw	\$75
Cardboard Piece	\$200
One Rubber Band	\$90
Aluminum Foil	\$125
Popsicle Sticks	\$100 for 10
Glue	\$50
Cardboard Paper Towel/ Toilet Paper Roll	\$150
One Foot of Tape	\$50
Paper Cup or Bowl	\$250
Plastic Spoon	\$225
Two Pipe Cleaners	\$65
Other item of choice (not listed)	\$200

**Testing Materials:**

For "snowballs," use cotton balls, balled-up paper, or pom-pom balls.



**Ask a grownup for permission to use these items.**

**Extra Challenge:** Design your snowball launcher within a budget of \$1,000 using the cost list above.



## Snowball Fight!

After the large snowstorm that hit the town of Baileyville, the mayor has decided to organize a big snowball fight that will consist of two teams: A and B. One of the leaders from Team A has requested your help as an engineer to design a catapult or other device that will launch a snowball. He is hoping the device will help save people's energy and be provide his team an advantage over the other team in the snowball fight.



Ask an adult to **Share your STEM** on Facebook.  
**#C5ISRCenterSTEM**

**Mission:** To create a snowball-launching device that will send a snowball the furthest distance possible.

**Requirements:**

- The device must be free-standing and stable.
- It must be able to launch a snowball

**Design Process:**

**ASK:** What is the problem you need to solve? A way to launch a snowball the farthest distance possible.

**IMAGINE:** Brainstorm and decide on one idea. What type of device are you going to design to launch a snowball?

**PLAN:** Draw a picture of your device. What will you snowball launcher look like?

**CREATE:** Use the materials to create a prototype of your snowball launcher device.

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

### COME & GET YOUR STEM ON...

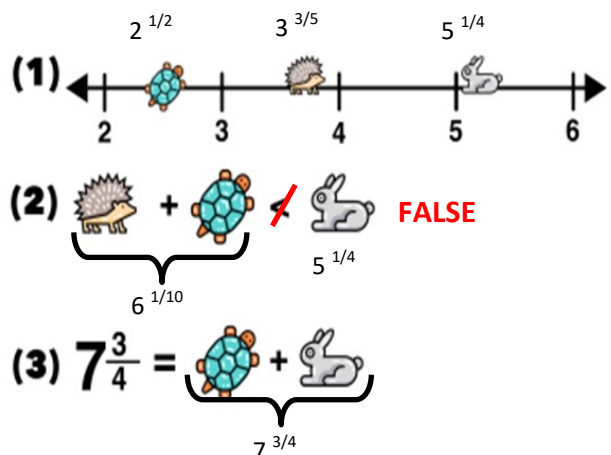
The C5ISR Center Community Outreach Program is dedicated to providing quality STEM programs to students K-12. For more information about our STEM Outreach Programs, visit us on the web:

[https://c5isr.ccdc.army.mil/student\\_programs/](https://c5isr.ccdc.army.mil/student_programs/)

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



### SOLUTION TO PUZZLE ON PAGE 1



## STEM IN THE NEWS



### “Never Smile at a Crocodile...” The Evolution of Crocodiles.

The crocodiles we see today along the coasts of the Americas and around the world are actually quite similar to their prehistoric ancestors. New research from the University of Bristol in England explains why crocodiles have not drastically changed since the age of the dinosaurs.

In the Triassic Period, roughly 200 to 252 million years ago, creatures called phytosaurs walked, crawled, and swam the Earth. These early ancestors looked similar to the modern crocodile of today, although their nostrils were positioned closer to the tops of their heads rather than down at the end of their long snouts. These creatures lived on a diet of fish and other marine organisms, and they were primarily terrestrial reptiles, meaning they mostly lived and walked on land.

The Jurassic Period showed the beginning stages of the crocodile adapting to a more semi-aquatic existence where they lived both on land and in water. Around 200 million years ago, dinosaurs dominated the Earth, and the prehistoric crocodile had to adapt for better survivability. Their bodies grew longer, and their limbs splayed and spread out, allowing them to swim better. Their snouts flattened and grew narrow, allowing them to hunt prey from the water.

The recent research, published in the scientific journal *Nature Communications Biology*, explains how crocodiles follow a pattern of evolution called “punctuated equilibrium.” Punctuated equilibrium is a term that describes and predicts which certain evolutionary changes take place in short periods of time, and which are tied to specific events. The rate at which crocodiles have evolved is slow when compared to other species; however, this research suggests that there have been small spurts and periods of rapid evolution when the crocodiles’ environment has changed around them. The research has discovered that when the climate is warmer, the crocodiles’ evolution accelerates.

According to Dr. Max Stockdale of the University of Bristol’s School of Geographical Sciences, this research was analyzed using a machine learning algorithm that estimated the crocodile’s rates of evolution. Evolutionary rate is defined as the amount of change that has taken place over a period of time, and evidence is gathered by comparing data gathered from fossils. They studied body size, how much food crocodiles need, how large crocodiles’ populations are, and how likely crocodiles are to become extinct.

Their findings have shown that the punctuated equilibrium and lack of evolution crocodiles have exhibited is a result of this slow evolutionary rate. Crocodiles had long ago already adapted to its environment and did not need to evolve to ensure their survival. This study also suggests that this could be a contributing factor as to why crocodiles survived the Cretaceous Period when the dinosaurs did not.

Dr. Stockdale also added that the crocodile “landed upon a lifestyle that was versatile enough to adapt to the environmental changes that have taken place since the dinosaurs were around.” The research team plans to continue their studies to discover why certain prehistoric crocodiles died out and others have not.

#### The Better to Bite You With...

Did you know that a crocodile's jaws can apply 5,000 pounds of pressure per square inch? A human's jaw only produces 100 pounds of pressure per square inch. Also, crocodiles can go through up to 4,000 teeth over a lifetime.

#### Sources:

[evolution.berkeley.edu/evolibrary/article/side\\_0\\_0/punctuated\\_01](https://evolution.berkeley.edu/evolibrary/article/side_0_0/punctuated_01)  
[www.sciencedaily.com/releases/2021/01/210107083751.htm](https://www.sciencedaily.com/releases/2021/01/210107083751.htm)  
[www.thoughtco.com/crocodiles-the-ancient-cousins-of-dinosaurs-1093747](https://www.thoughtco.com/crocodiles-the-ancient-cousins-of-dinosaurs-1093747)  
<https://www.ecowatch.com/crocodiles-evolution-research-2649784183.html?rebelltitem=4#rebelltitem4>



## STEM Activity/Challenge



### Materials:

For both recipes, you will need:

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

Before you begin, take a moment to make a prediction on which fake snow recipe will look and feel the most like snow.

Then be sure to record your observations about texture, temperature and stickiness (can you make a snowball) after each recipe is complete.

Once you are finished, compare your observations to determine which recipe was the most authentic.

### SAFETY NOTICE

Make sure you have an adult's permission and supervision before



## Bring On The Snow!

Do you feel like you haven't seen enough snow this year? Try this fun experiment where you will test

two different snow recipes to determine which one feels the most like snow. The best part is you will get to play with snow without having to bundle up for the cold!

### Recipe 1: Baking Soda Artificial Snow

#### Materials:

- 4 tablespoons of baking soda
- 1 tablespoon of cold water

#### Directions:

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, fork, or your hands.
4. Take a moment to observe how this fake snow feels in relation to its texture and coldness.

### Recipe 2: Vinegar, Baking Soda, and Paper Towel Artificial Snow

#### Materials:

- ½ cup of baking soda
- Water
- Paper towels ripped into small pieces (about a cup of paper towel pieces)
- \*You can also use a piece of paper, napkin, or tissues

#### Directions:

1. Place your paper pieces into a bowl and add 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 this fake snow feels in relation to its texture and coldness.

## Science Explained

In the first recipe, 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.

In the second recipe, you may have noticed that it also had a crunch factor that is similar to snow, but it also has a rough feeling to the texture. When you first mixed the baking soda with the vinegar, you may have noticed bubbles that formed. They formed 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.