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…

Issue 3

Filling in the Blanks - Math Challenge

5	+		-	2	=	6
-		+		+		
	+	7	-		=	2
+		-		+		
	+	6	+		=	15
=		=		=		
9		4		12		

Directions – Use the information provided to complete the puzzle above. Plug the numbers below into the yellow boxes to make each equation true. Each number below can only be used once. (The solution is on the last page)

Example:

1	+	2	+	3	=	6
+		+		+		
4	+	5	+	6	=	15
+		+		+		
7	+	8	+	9	=	24
=		=		=		
12		15		18		

NUMBERS TO PLUG INTO YOUR PUZZLE

1 3 4 8 9

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.

https://www.facebook.com/CCDC.C5ISR/

#C5ISRCenterSTEM

High-Flying Flag Challenge (Grades K-2)

SCIENCE FACT

Wind speed refers to the movement of air in an outside environment. This movement is affected by many factors that include geographic location, weather, pressure gradient and jet streams.

Happy Memorial Day! It's time to let our flags fly.

The U.S. Army Combat Capabilities Development Command has asked you to use your creative skills to help engineers design a new flag and flag pole for the C5ISR Center.

Materials

For Flag:

- Paper
- Pencils, Crayons or Markers

For Flagpole

- Newspaper
- Tape
- Paper clips
- Plastic straws
- Paper towel rolls
- Plastic bottles

Other

- Scissors
- Paper and pencil for designing
- Fan or Hair Dryer for testing

Your Flag and Flagpole Must Be:

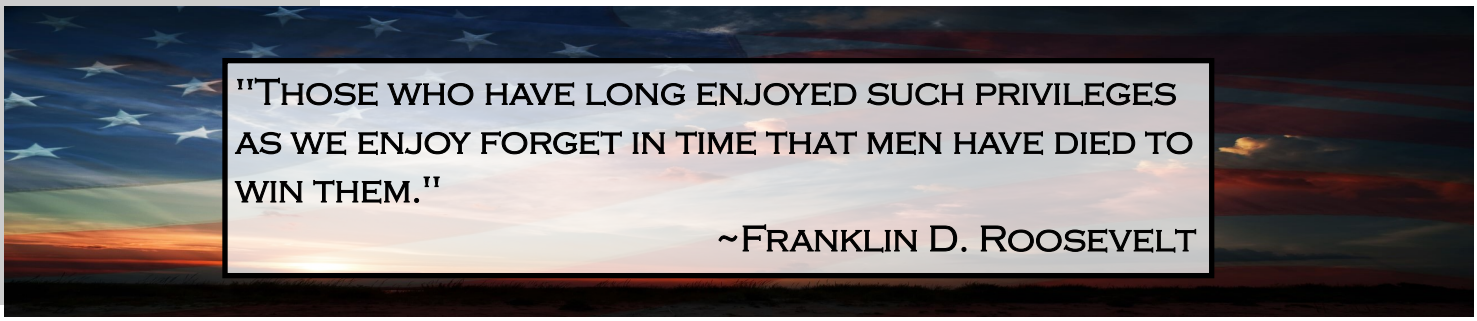
1. Free standing
2. As tall as possible
3. Able to attract attention from a distance

Design Process:

1. **ASK:** What is the problem you need to solve? Design a flag that can be noticed from far away and a flagpole that is tall and free standing.
2. **IMAGINE:** What will your flagpole design look like? Brainstorm and decide on one idea.
3. **PLAN**: What will your flag look like? Draw a picture of your flag.
4. **CREATE**: Use the materials to create a model of your flag.
5. **IMPROVE:** Test your flagpole.

   How tall is your flagpole? Measure it. Can you make it taller?
   Will your flagpole withstand the wind? Use a fan or hair dryer to find out.
   Can you make it stronger?
   How can you improve your flag and flagpole structure?
   If you had more choices of materials, what would you use and why?

6. **SHARE:** Show your family your flag, tell them how tall your flagpole is, and ask a grownup to share a photo of your design on Facebook using the following hashtag: **#C5ISRCenterSTEM**



STEM to the Rescue (Grades 3-5)

Materials:

- Straws
- Craft sticks
- String/rope/ yarn/ twine
- Rubber bands
- Construction paper
- Cardboard (Ask your grownup if you can use old cereal boxes or other items found around your house)
- Ruler
- Paper and pencil for designing
- Kitchen chair

Cargo:

- 8 pennies
- 12 paper clips
- 3 pens

VOCABULARY:

Force: A push or pull that causes an object to move, change direction, change speed, or stop.

Momentum: A measurement of mass in motion.

Simple Machine: A machine with few or no moving parts that is used to make work easier.

Making Work Easier...

We all know how to work hard. Sometimes, however, no matter how hard we work, we just can't get it done. In times such as these, we have to work smart! One way to work smart is by using a simple machine to make work easier. For example, hand cranks change the direction of a force or the amount of force needed to complete a task. Sometimes, you can combine more than one simple machine: using a lifting device with a hand crank distributes weight differently and makes it easier to lift heavy items.

Mission: Our Soldiers need your help. The military has asked you to design a rescue lift to move important cargo from the ground floor to the top of a second story building. Build a prototype for a **simple machine** that the Soldiers can use to lift their cargo.

*Remember—a prototype is a smaller model of your finished product. For the purposes of your prototype, use a standard kitchen chair as the roof of your building. Your prototype will have to lift your cargo from the floor to the seat of the chair.

Requirements:

Your prototype must:

- Lift your "cargo" from the floor to the chair.
- Include a winder or a crank to move the cargo.

Design Process:

ASK: What is the problem you need to solve? Design a prototype for a device that will move cargo to the top of a building.

IMAGINE: What will the rescue device look like? Brainstorm and decide on one idea.

PLAN:

- Draw a picture of your rescue device. Label the parts and the materials you plan to use.
- Measure the distance from the floor to the seat of the chair ,and mark it on your design.
- Determine how long your yarn/string/rope must be to lift the cargo from the floor to the seat of the chair.

CREATE: Build your prototype.

IMPROVE: Use the materials in the cargo list to test your rescue device. Once you have completed your tests, consider the following:

- What happened when the cargo was lifted?
- Are there ways that you can improve your device?
- If you had additional materials, what would you use?

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

Safety First (Grades 6-8)

For your Protection...

When it comes to engineering Personal Protective Equipment (PPE), it is important to understand workplace hazards. Research on transmission of viruses and other infectious agents impacts the design of healthcare PPE. Other factors in PPE engineering are making it reusable, making it comfortable, and making sure it is not going to keep the person wearing it from completing her or his job.

Mission:

The COVID-19 pandemic has led to a significant shortage in PPE for doctors, nurses, police, firefighters and other emergency response personnel. The Department of Defense has tasked their best engineers to create PPE in an innovative way, and they have recruited you to design an enhanced piece of protective equipment for those on the frontlines.

Requirements:

- Use only the items that you can find in your home to build a prototype.
- Explain how your PPE device will work.

IMPORTANT NOTE: You are building a prototype of your idea. Your prototype should NOT be used in place of real PPE when you leave your home.

Design Process:

ASK: What is the problem you need to solve?

IMAGINE: What is the purpose of your invention? Brainstorm and decide on one idea.

PLAN: What will your invention look like? Draw a picture of the resource that you invented.

CREATE: Use materials that you find in your home to design a prototype.

IMPROVE: Will your invention work? What could make it better?

Questions to think about:

- Will your design or invention be cost sufficient, reliable and safe?
- Did you succeed in designing PPE for those on the frontlines?
- If you had access to additional material, what would you use? Why?
- If you had to do it all over again, would your plan design change? Why?

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How to Wear a Cloth Face Covering

Please review the information below from the Centers for Disease Control (CDC)

Cloth face coverings should:

- Fit snugly but comfortably against the side of the face
- Be secured with ties or ear loops
- Include multiple layers of fabric
- Allow for breathing without restriction
- Be able to be laundered and machine dried without damage or change to shape

https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/diy-cloth-face-coverings.html

Lighten the Load (Grades 9-12)

DID YOU KNOW?

According to the United States Government Accountability Office, the average Soldier carries up to 120 lbs. of equipment.

Materials to consider:

Look up the following materials and consider how they could be used in your new device:

- Ceramics
- Polymers
- Metals

Lighter and Safer

One of the most important considerations for our Military engineers is keeping our Soldiers safe. Military personnel have a variety of protective gear such as vests, armor and helmets to protect them. However, adding more protection, increases the weight our Soldiers must carry.

Our scientists and engineers are trying to find ways to reduce this weight while improving the form, fit and function of our Soldiers' protective gear.

Mission:

APG engineers have enlisted you to design a new device to keep Soldiers protected while lightening their load. The device needs to be something that can be worn, or something that that can be portable for use in the field. The device should **not** include any sort of weapon and must be designed for a specific purpose.

Instructions:

Design

1. Decide what kind of device you would like to design—what is its purpose?
2. Do some basic research on the various lightweight, protective materials.
3. Select the type of material you would like to use in your design.
4. Sketch your design. Label the various materials you would use.

Build:

1. Look around your house for materials you can use to build a prototype.
2. Use these materials to build a prototype of your design.

Questions to think about:

Did you succeed in designing a new device that will protect Soldiers?

If you had access to additional materials what would you have used? Why?

If you had to do it all over again, would your plan design change?

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SOLUTION FROM PAGE 1

5	+	3	-	2	=	6
-		+		+		
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=		=		=		
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Standards/ Common Core Math Standards:

ACTIVITY ONE: K-2-ETS1-2. Develop a simple sketch, drawing or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

ACTIVITY TWO: 3-5-ETS1-3 Engineering Design: Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved. CCSS. MATH.CONTENT.5.MD.A.1: Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

ACTIVITY THREE: MS-ETS1-1 Engineering Design (6-8 grade) Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

ACTIVITY FOUR: HS-ETS 1-2 Engineering Design (9-12): Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS ETS 1-3 Engineering Design (9-12): Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.