

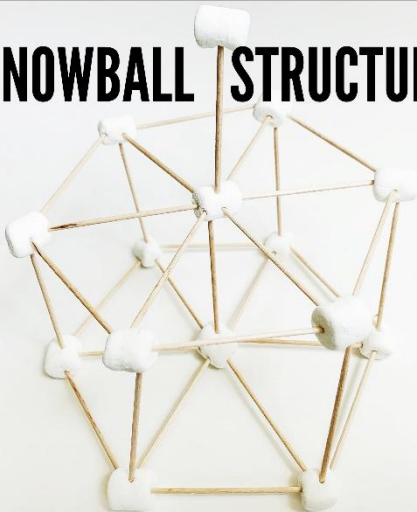
January

STEM

LOW PREP

Winter challenges

SNOWBALL STRUCTURE



**SLEDDING
RAMP**



HIBERNATION STATION



CREATED BY BROOKE BROWN

3 LOW PREP STEM CHALLENGES + BONUS BRAINBUILDER ACTIVITY

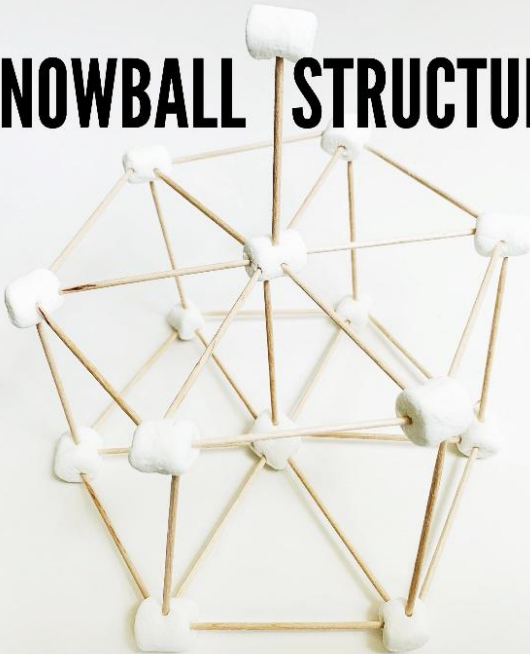
**SLEDDING
RAMP**



HIBERNATION STATION



SNOWBALL STRUCTURE

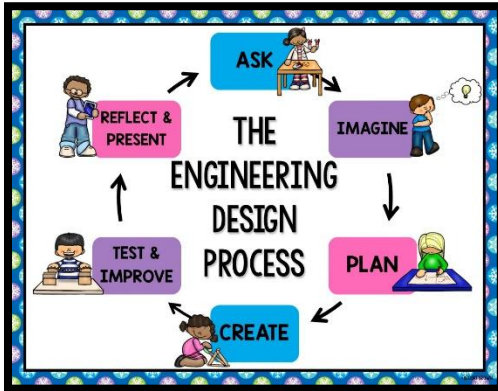


SNOWFLAKE SYMMETRY



**BONUS
BRAINBUILDER**

- ✓ SIMPLE SUPPLIES
- ✓ INTERACTIVE ANCHOR CHARTS
- ✓ VISUAL VOCABULARY
- ✓ QR CODE RESEARCH



Sledding Ramp

Your friends are having a sledding contest!

Construct a ramp that will make travel the farthest distance.

MATERIALS:

- Construction paper
- Linking cubes (30 pieces)
- Masking tape (1 ft.)
- Plastic bottle caps
- Yardstick

Hibernation Station

The animals need a shelter to keep them safe and warm in the winter.

Construct the warmest shelter possible that will protect at least 3 animals.

MATERIALS:

- Aluminum foil
- Paper plates for base
- Variety of insulation scraps such as fleece, flannel, wool, batting, foam, cotton balls, or foam board
- Scotch tape
- Mini cups with paper animals taped to the front

Snowball Structure

You have been asked to create a sculpture for the winter party.

Construct the tallest structure possible using only marshmallows and toothpicks.

MATERIALS:

- Mini marshmallows
- Toothpicks
- Ruler

BRAINBUILDER

Snowflake Symmetry

Work with your team to create the largest possible symmetrical snowflake design.

You may create your snowflake out of popsicle sticks, pattern blocks, or Q-tips

WORDS TO KNOW

inclined plane a simple machine that slopes at an upward angle, also called a ramp	friction surface resistance to motion
speed 	distance

WORDS TO KNOW

shelter a dwelling or home designed for protection	hibernate to spend the winter in an inactive or dormant state
--	---

WORDS TO KNOW

pyramid a three-dimensional solid with a polygonal base and triangular faces that meet at a point (apex)	dome a rounded solid with a circular base, also called a hemisphere
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Sledding Ramp

REAL WORLD EXAMPLES

Examples of Inclined Planes

Hibernation Station

REAL WORLD EXAMPLES

Animals that Hibernate

What is similar? What is different?

Snowball Structures

REAL WORLD EXAMPLES

Shapes Found in Snow Structures

What is similar? What is different?

EXPLORE RAMP

INCLINED PLANES 	SLEDDING
FRICITION 	SLED FACTS

EXPLORE ANIMALS IN WINTER

hibernation 	hibernating animals
ANIMALS WITH WINTER COATS 	INSULATING HOMES

EXPLORE STRUCTURES

STRONG STRUCTURES 	MARSHMALLOW STRUCTURES
IGLOOS 	3D SHAPES

DIFFERENTIATED RECORDING SHEETS FOR K-5TH GRADE

Sledding Ramp Name: _____

BLUEPRINT

TEST 1
How high is your ramp? _____ How far did your sled go? _____

TEST 2
How high is your ramp? _____ How far did your sled go? _____

TEST 3
How high is your ramp? _____ How far did your sled go? _____

Hibernation Station Name: _____

BLUEPRINT

MATERIALS

How does your shelter keep your animals WARM?

snowball structure Name: _____

BLUEPRINT

Measure the height of your structure.

TEST 1 (5 min.)
TEST 2 (10 min.)
TEST 3 (15 min.)

Sledding Ramp Name: _____

MY BLUEPRINT

Draw a picture of your ramp.

SLEDDING TESTS

TEST 1
How high is your ramp? _____ How far did your sled go? _____

TEST 2
How high is your ramp? _____ How far did your sled go? _____

TEST 3
How high is your ramp? _____ How far did your sled go? _____

Hibernation Station Name: _____

MY BLUEPRINT

Draw your materials.

Draw a picture of your shelter.

How many animals fit inside your shelter?

Color the animals that are in your shelter.

snowball structure Name: _____

MY BLUEPRINT

Draw a picture of your structure.

Color the shapes that you used in your design. Circle the shapes that were strongest.

Measure the height of your structure.

TEST 1 (5 min.)
TEST 2 (10 min.)

snowflake symmetry Name: _____

Draw your snowflake design. Use a marker or crayon to draw all the lines of symmetry.

LET'S REFLECT!

- What was most difficult about this challenge?
- How are ramps and inclined planes useful in real life?
- How did raising the height of your ramp affect the speed and distance of your sled?
- How did friction affect the speed and distance of your sled?
- How do you think extending or shortening the length of the ramp might affect the speed and distance of your sled?
- If we completed this challenge again, what would you do differently next time?

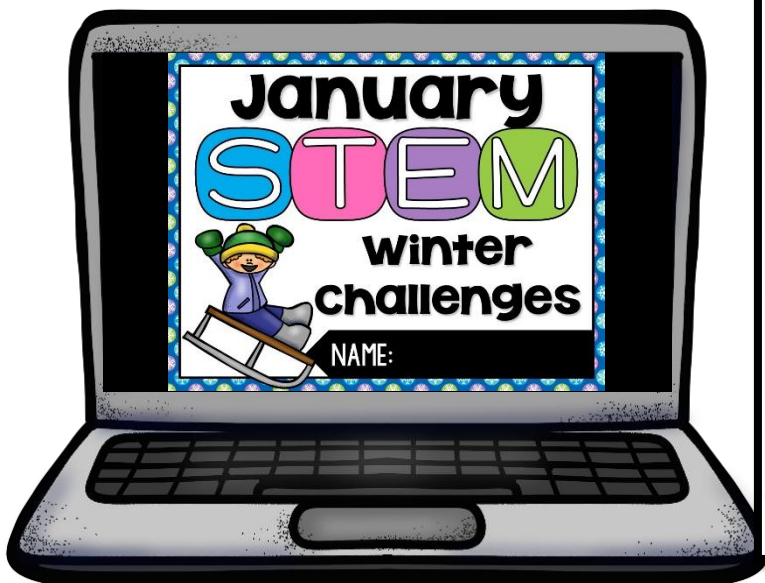
LET'S REFLECT!

- What was most difficult about this challenge?
- What are some different ways that animals adapt to winter conditions?
- How are some natural animal shelters insulated?
- How did you insulate your shelter?
- How do humans adapt to winter to conditions?
- What types of things need to be insulated (buildings/shelters, people, food/drinks) and why?
- If we completed this challenge again, what would you do differently next time?

LET'S REFLECT!

- What was most difficult about this challenge?
- What types of two-dimensional and three-dimensional shapes did you use in your design?
- How do you think the shapes and patterns might relate to the strength of your structure?
- Which design was the highest and why do you think so?
- What parts of your structure were most important for it to be the most balanced and stable?
- How are real structure designs similar to and different from your design?
- If we completed this challenge again, what would you do differently next time?

DIGITAL GOOGLE SLIDES NOTEBOOK



STEM Challenge Assessment Rubric

Challenge: _____
Date: _____
Student Name: _____

3	2	1
Student followed all instructions for challenge.	Student followed some instructions for challenge.	Student did not follow instructions for challenge.
Student used best effort and perseverance on challenge.	Student used some effort and perseverance on challenge.	Student did not show effort or perseverance on challenge.
Student completed assigned blueprint and reflection sheet.	Student partially completed assigned blueprint and reflection sheet.	Student did not complete assigned blueprint and recording sheet.
Student showed accuracy in testing, calculating, and measuring.	Student showed some accuracy in testing, calculating, and measuring.	Student did not show accuracy in testing, calculating, or measuring.
Student fully cooperated with group members and contributed fairly.	Student partially cooperated with group members and contributed fairly.	Student struggled to cooperate with group members and/or failed to contribute.
Student fully participated in class discussions.	Student somewhat participated in class discussions.	Student did not participate in class discussions.

Comments: _____

TOTAL POINTS: _____ /18

My January STEM Journal

NAME: _____

We Need STEM Supplies!

Dear Families,

We are learning all about Science, Technology, Engineering, and Math through STEM lessons, and we need your help! If you are able to donate any of the following supplies for our STEM Challenges, please detach and return the form below and send back to school with your child. We greatly appreciate your support and generosity!

We are in need of the following items by _____

Thank you so much for helping to make our STEM lessons possible!
Please contact me at _____ with any questions.

Sincerely, _____

If you are able to donate, please detach and return the form below.

Parent Name(s): _____
Child's Name: _____
I am able to donate: _____

SAY Hello TO STRESS-FREE STEM!

SUPPLIES CHECKLIST

STEM CHALLENGE	ITEM	NUMBER PER GROUP	I HAVE IT
Sledding Ramp	construction paper or cardstock	2-3 sheets	
	linking cubes	30	
	masking tape	1 ft.	
	plastic bottle cap/lid	1	
	yardstick	1	
Hibernation Station	aluminum foil	2 ft.	
	paper plate	1	
	insulation scraps such as fleece, flannel, wool, batting, foam, cotton balls, or foam board	small tub	
	scotch tape	1 roll	
	mini cups with paper animals taped to the front	1 set	
Snowball Structure	mini marshmallows	30-40	
	toothpicks	50	
	ruler	1	
BONUS BRAINBUILDER: Snowflake Symmetry	tub of popsicle sticks	1 per class	
	tub of pattern blocks	1 per class	
	tub of Q-tips	1 per class	

STANDARDS ALIGNMENT

JANUARY STANDARDS ALIGNMENT			
CHALLENGE	ENGINEERING	SCIENCE	MATH
Sledding Ramp	K-2-ETS1 Engineering Design: K-2-ETS1.A, 3-5-ETS1.A, 3-5-ETS1.B	K-PS2 Motion and Stability: Forces and Interactions 3-PS2 Motion and Stability: Forces and Interactions 5-PS2 Motion and Stability: Forces and Interactions	189. Make sense of problems, and persevere in solving them. 192. Reason abstractly and quantitatively. 193. Model with mathematics. 195. Use appropriate tools strategically. 198. Attend to precision.
Hibernation Station	K-2-ETS1 Engineering Design: K-2-ETS1.A, 3-5-ETS1.A, 3-5-ETS1.B 3-5-ETS1 Engineering Design: 3-5-ETS1.A, 3-5-ETS1.B, 3-5-ETS1.C	K-LS1 From Molecules to Organisms: Structures and Processes K-ESS2 Earth's Systems 1-ESS2 Earth's Systems 1-ESS3 Biological Evolution: Unity and Diversity 3-ESS3 Earth and Human Activity	189. Make sense of problems, and persevere in solving them. 192. Reason abstractly and quantitatively. 193. Model with mathematics. 195. Use appropriate tools strategically.
Snowball Structure	K-2-ETS1 Engineering Design: K-2-ETS1.A, 3-5-ETS1.A, 3-5-ETS1.B 3-5-ETS1 Engineering Design: 3-5-ETS1.A, 3-5-ETS1.B, 3-5-ETS1.C	2-Structure and Properties of Matter Action/Reaction Forces, tension and compression Forces, weight, balance, stability	189. Make sense of problems, and persevere in solving them. 193. Model with mathematics. 195. Use appropriate tools strategically. 198. Attend to precision. 197. Look for and make use of structure.
BONUS BRAINBUILDER: Snowflake Symmetry	K-2-ETS1 Engineering Design: K-2-ETS1.A, 3-5-ETS1.A, 3-5-ETS1.B 3-5-ETS1 Engineering Design: 3-5-ETS1.A, 3-5-ETS1.B, 3-5-ETS1.C	2-Structure and Properties of Matter Action/Reaction Forces, tension and compression Forces, weight, balance, stability	189. Make sense of problems, and persevere in solving them. 193. Model with mathematics. 195. Use appropriate tools strategically. 197. Look for and make use of structure. Symmetrical figures

CHALLENGE OVERVIEW

STEM CHALLENGE: Sledding Ramp



OVERVIEW: This challenge is designed for students to experiment with ramps/inclined planes and how the height of a ramp affects the speed and distance of an object that slides down it. Students will also experiment with how friction affects the motion of an object. Cardstock or construction paper can be folded into a sloping shape similar to a slide, and can be folded upward on each side to keep the bottle caps from falling off. Linking cube towers taped to the top of the ramp make it easy and quick for students to raise and lower the height and test/measure each sled distance.

KEY SKILLS: Simple machines (inclined planes), Speed and Distance, Friction, Measurement

SUGGESTED READ ALOUDS: [Red Sled by Lita Judge](#), [Max and Marla by Alexandra Boiger](#), [Roll, Slope, and Slide by Michael Dahl](#)

MATERIALS PER GROUP: 2-3 sheets of construction paper or cardstock, 30 linking cubes, 1 ft. of masking tape, plastic bottle cap or lid, yardstick

KEY SKILLS

MATERIALS

LESSON PLAN

1. Activate students' prior knowledge by asking them to share what they already know about ramps/inclined planes and how they work. Discuss the different ways ramps are used and how they make work easier.
2. Share and discuss the videos on "Explore Ramps."
3. Hold a class discussion, using the teacher chart and real world examples to guide student thinking. (You can project the chart on an interactive whiteboard or document camera.) Record their ideas on the teacher chart.
4. Introduce the STEM challenge and permitted materials.
5. Introduce and discuss key vocabulary cards related to the challenge.
6. Have students sketch blueprints of their designs on their recording sheets.
7. Distribute materials and allow students 45-60 minutes with partners or small groups to construct their ramps and test them, adjusting the height of the ramp to measure the distances their "sled" travels.
8. Hold a whole class closing discussion and reflection, allowing students to share their ramp designs. Use the "Let's Reflect" poster to guide the discussion.

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SUGGESTED READ ALOUDS

STEP BY STEP INSTRUCTIONS