

winter

STEM

SNOWBALL STRUCTURE



**snowball
structure
challenge**

CREATED BY BROOKE BROWN

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How to Use

The following STEM/STEAM challenge is designed to be completed with partners or in small groups. You will need to allow 45-60 minutes for the full activity to be completed. Needed supplies are inexpensive and can be found in your classroom or at most craft stores.

Components

LESSON PLAN

- Overview
- Skills
- Read Aloud Ideas
- Supplies

STUDENT INSTRUCTIONS

SNOWBALL STRUCTURE

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

Construct the tallest structure possible.

MATERIALS:

- Mini marshmallows or Styrofoam packing peanuts, 50 toothpicks, ruler



QR CODE WEBSITES & VIDEOS

EXPLORE STRUCTURES

<p>STRONG STRUCTURES</p> 	<p>MARSHMALLOW STRUCTURES</p> 
<p>IGLOOS</p> 	<p>3D SHAPES</p> 

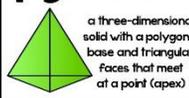
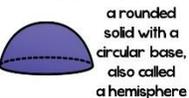
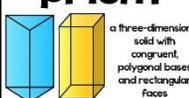
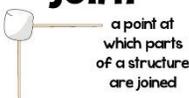
TEACHER ANCHOR CHART

SNOWBALL STRUCTURES

REAL WORLD EXAMPLES	Shapes found in Snow Structures
	
What is similar? What is different?	Strongest Shapes
Shapes found in Other Structures	

KEY VOCABULARY

WORDS TO KNOW

<p>pyramid</p>  <p>a three-dimensional solid with a polygonal base and triangular faces that meet at a point (apex)</p>	<p>dome</p>  <p>a rounded solid with a circular base, also called a hemisphere</p>
<p>prism</p>  <p>a three-dimensional solid with congruent, polygonal bases and rectangular faces</p>	<p>joint</p>  <p>a point at which parts of a structure are joined</p>

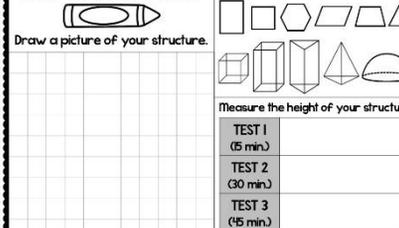
K-2nd RECORDING SHEET

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 (30 min.)	
TEST 3 (45 min.)	

3rd-5th RECORDING SHEET

SNOWBALL STRUCTURE Name: _____

BLUEPRINT

Measure the height of your structure.

TEST 1 (5 min.)	
TEST 2 (30 min.)	
TEST 3 (45 min.)	

Draw or write the two-dimensional and three-dimensional shapes that you used in your design.

Circle the shapes that were strongest. Why do you think they were strongest?

REFLECTION DISCUSSION QUESTIONS

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?

Optional Google Slides Notebook

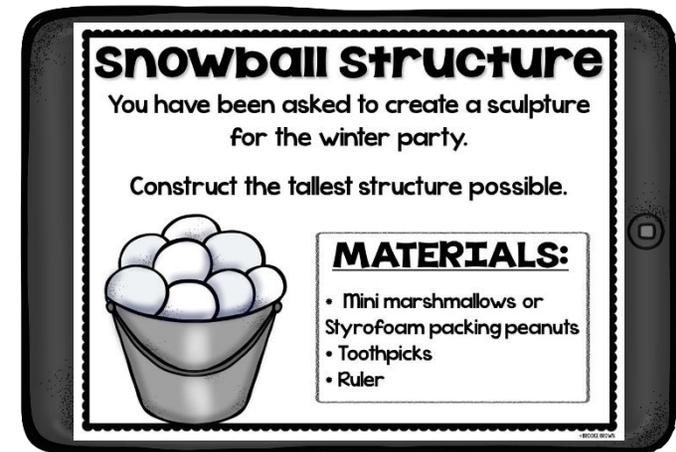
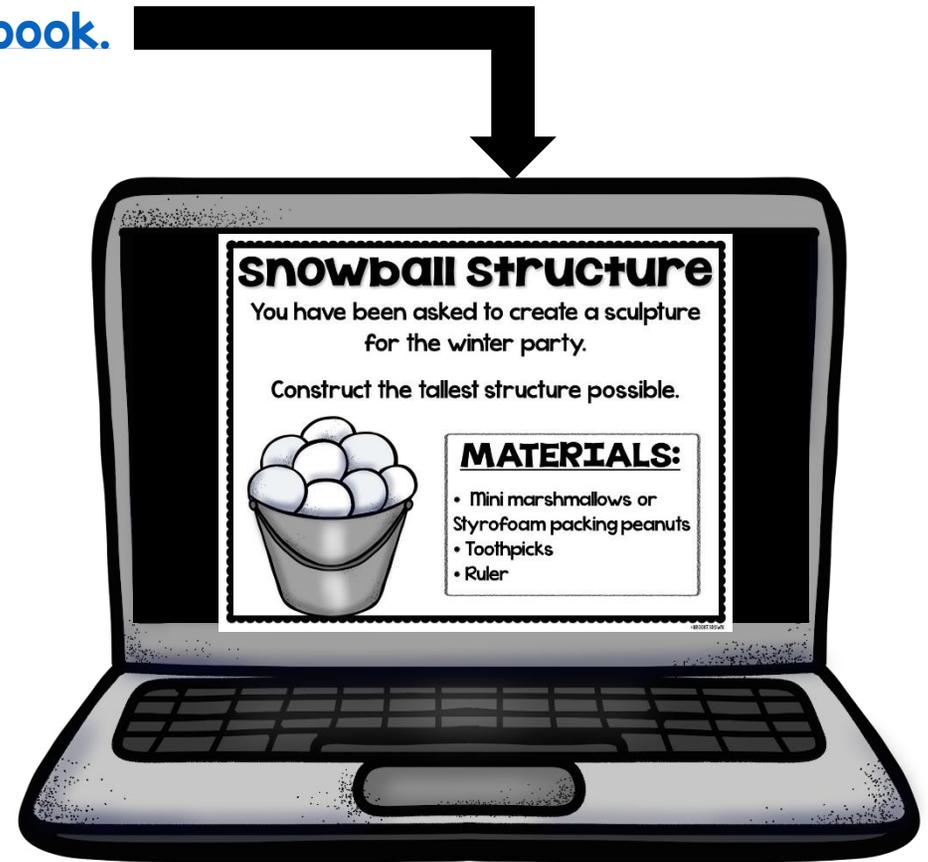
1. Download [Link for the Google Slides Notebook](#).
2. Sign into your Google Account.
3. **MAKE A COPY** of the notebook.

Each student will need their own Google account if they will be working on their own Digital Interactive notebook using Google Slides. If your students will be using iPads, they will also need to download the **Free Google Slides App** for the digital notebook to work properly.



Before you and your students begin editing/filling in your digital notebook, it is **VERY** important to first save a copy of the file on your own Google Drive, and then edit the copy. Your students will follow these same steps when you share the file with them.

YOU DO NOT WANT YOUR STUDENTS TO EDIT THE ORIGINAL FILE.



ASK



IMAGINE

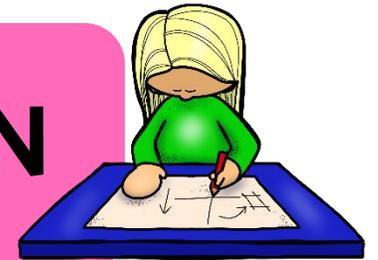


**THE
ENGINEERING
DESIGN
PROCESS**

**REFLECT &
PRESENT**



PLAN



**TEST &
IMPROVE**



CREATE



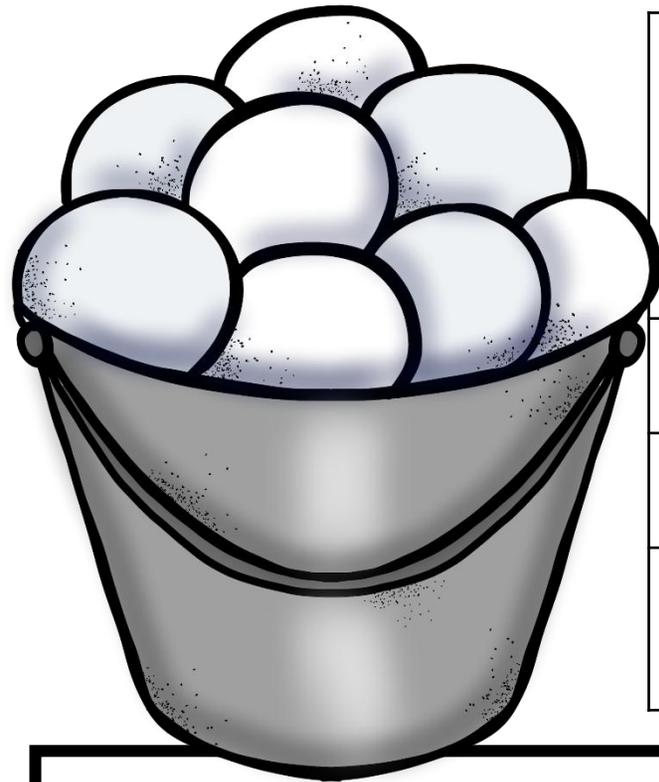
SUPPLIES CHECKLIST

STEM CHALLENGE	ITEM	NUMBER PER GROUP	I HAVE IT
Snowball Structure	mini marshmallows OR foam balls/packing peanuts	30-40	
	toothpicks	50	
	ruler	1	

STANDARDS ALIGNMENT

CHALLENGE	ENGINEERING	SCIENCE	MATH
Sledding Ramp	<p>K-2-ETSI Engineering Design: K-2-ETSI-1, 3-5 ETSI-2, 3-5 ETSI-3</p> <p>3-5-ETSI Engineering Design: 3-5-ETSI-1, 3-5 ETSI-2, 3-5 ETSI-3</p>	<p>K-PS2 Motion and Stability: Forces and interactions</p> <p>3-PS2 Motion and Stability: Forces and Interactions</p> <p>5-PS2 Motion and Stability: Forces and Interactions</p>	<p>MPI: Make sense of problems and persevere in solving them</p> <p>MP2: Reason abstractly and quantitatively</p> <p>MP4: Model with mathematics</p> <p>MP5: Use appropriate tools strategically</p> <p>MP6: Attend to precision</p>

STEM CHALLENGE: Snowball Structure



OVERVIEW: Students will attempt to build the tallest possible structure using only marshmallows and toothpicks. Before beginning, model how to gently connect a marshmallow and toothpick. Students will measure the height of their structure three times in 15 minute intervals. Students will most likely discover that triangular prisms, hexagonal prisms, domes, and pyramids are more durable than cubes and rectangular prisms.

KEY SKILLS: Three-dimensional shapes and structures, Engineering structures, Measurement

SUGGESTED READ ALOUDS: [Look at That Building! by Scot Ritchie](#), [Igloos by Jack Manning](#), [Building Snow Forts by Dana Meachen Rau](#)

MATERIALS PER GROUP: **TIP:** Open the bag of marshmallows a few days before this challenge to allow them to harden a little before students build with them. 30-40 mini marshmallows OR Styrofoam foam balls or packing peanuts, 50 toothpicks, ruler

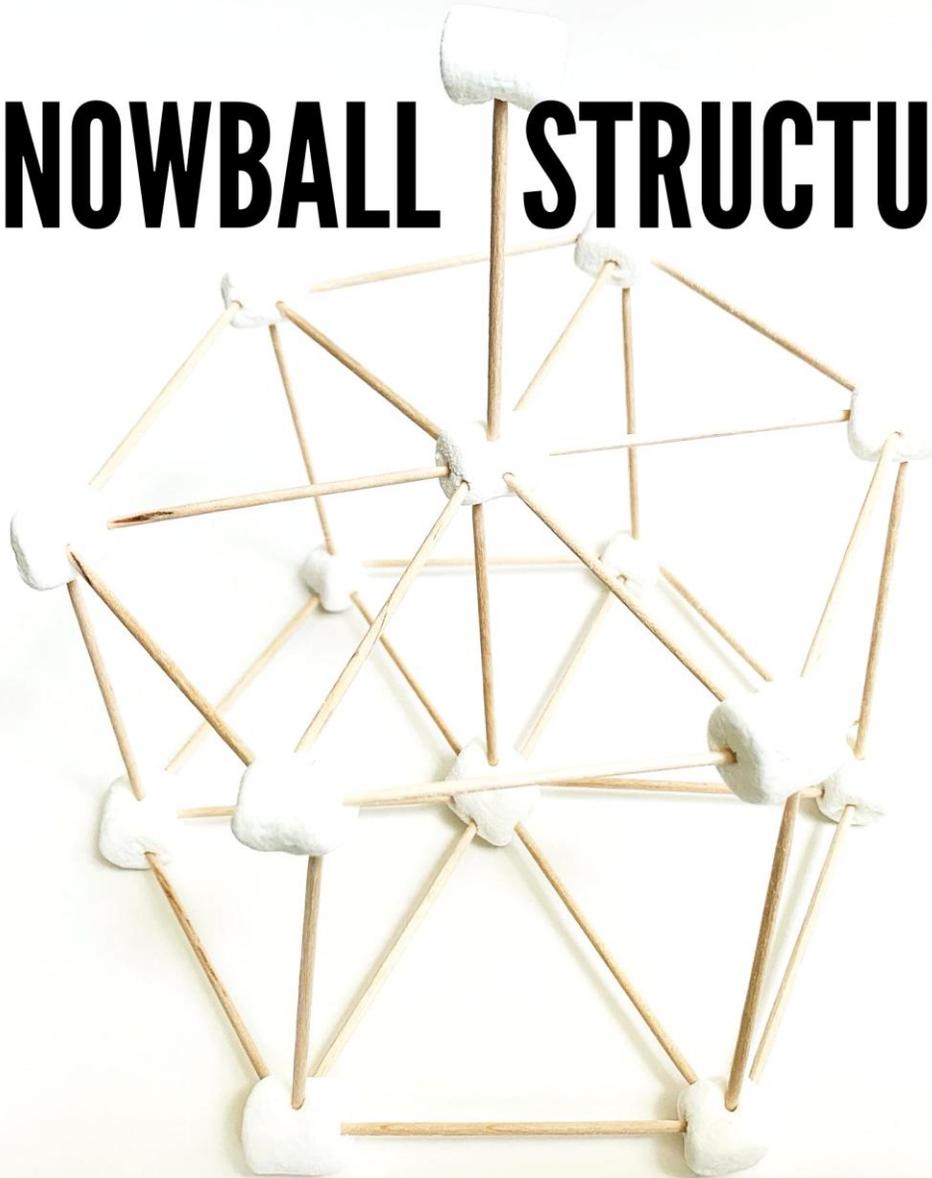
LESSON PLAN

1. Activate students' prior knowledge by asking them to share what they already know about strong structures and what shapes are used to build buildings. Ask them to predict which 3D shapes might be strongest and why.
2. Share and discuss the videos/websites on "Explore Structures"
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 minutes with partners or small groups to construct their structures and measure the heights after three 15 minute intervals.
8. Hold a whole class closing discussion and reflection, allowing students to share their structure designs. Use the "Let's Reflect" poster to guide the discussion.

snowball structure

POSSIBLE PRODUCT
(for teacher reference only)

SNOWBALL STRUCTURE



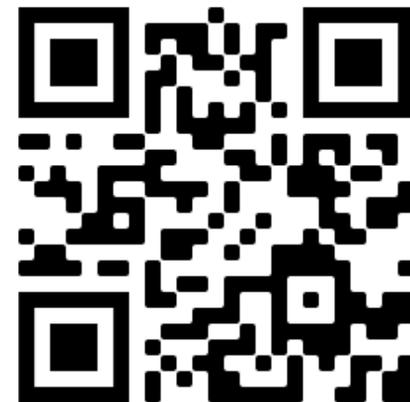
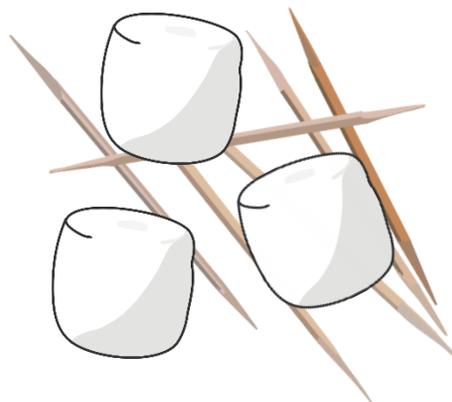
EXPLORE

STRUCTURES

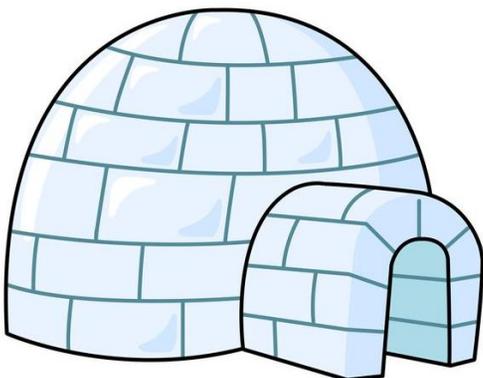
STRONG STRUCTURES



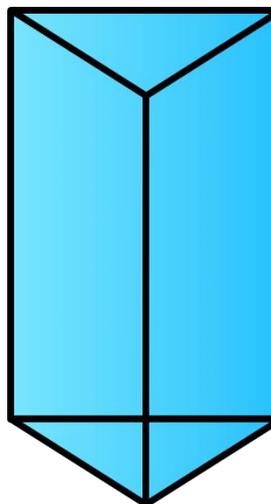
MARSHMALLOW STRUCTURES



IGLOOS



3D SHAPES



Snowball Structures

REAL WORLD EXAMPLES



What is similar? What is different?

Shapes found in Snow Structures

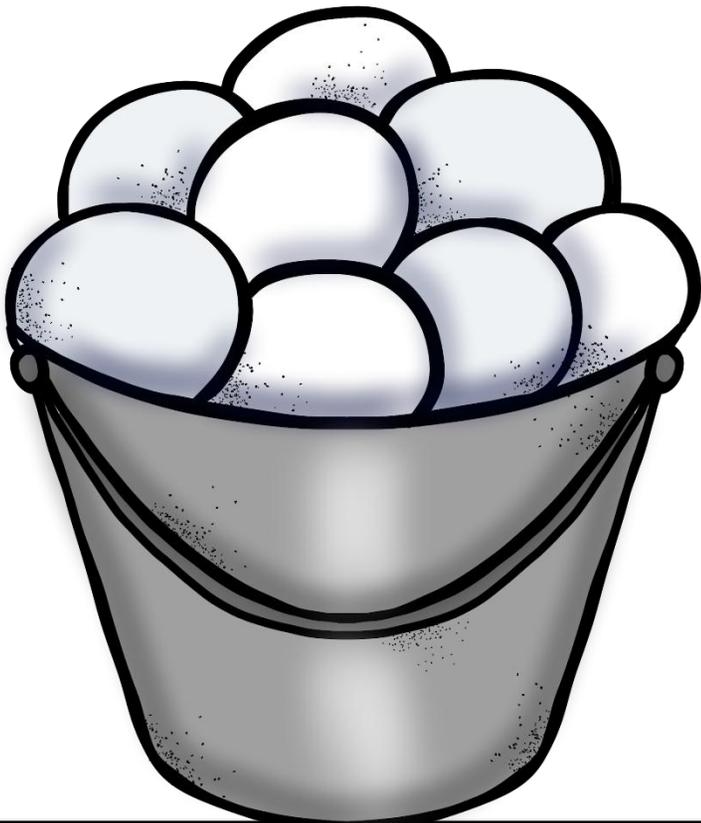
Shapes found in Other Structures

Strongest Shapes

snowball structure

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

Construct the tallest structure possible using only marshmallows and toothpicks.



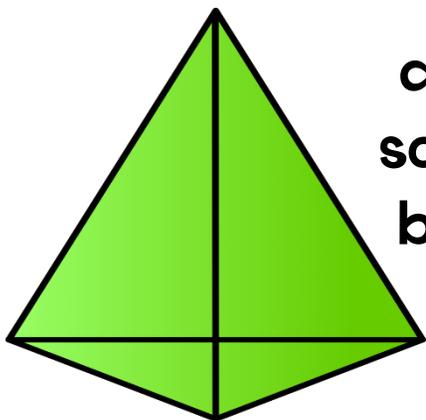
MATERIALS:

- * Mini marshmallows OR foam balls/packing peanuts
- * Toothpicks
- * Ruler

WORDS TO KNOW

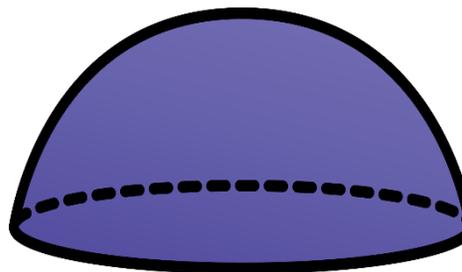


pyramid



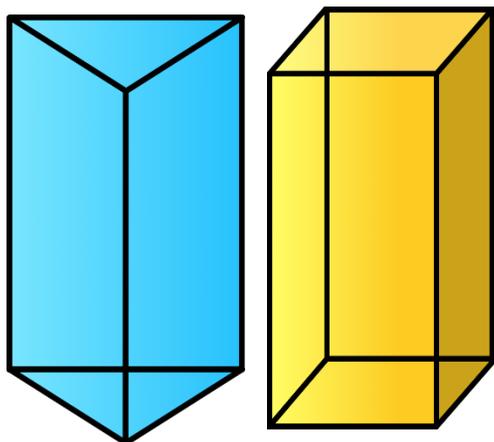
a three-dimensional solid with a polygonal base and triangular faces that meet at a point (apex)

dome



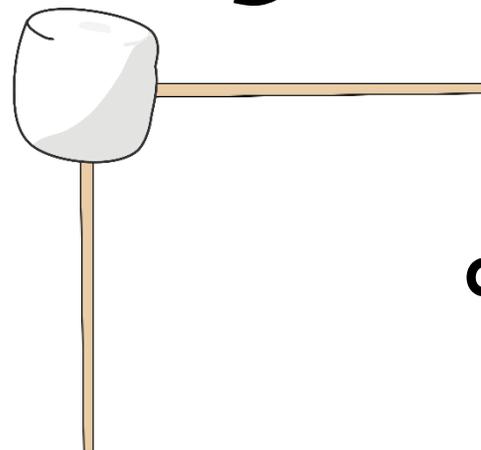
a rounded solid with a circular base, also called a hemisphere

prism



a three-dimensional solid with congruent, polygonal bases and rectangular faces

joint



a point at which parts of a structure are joined



snowball structure

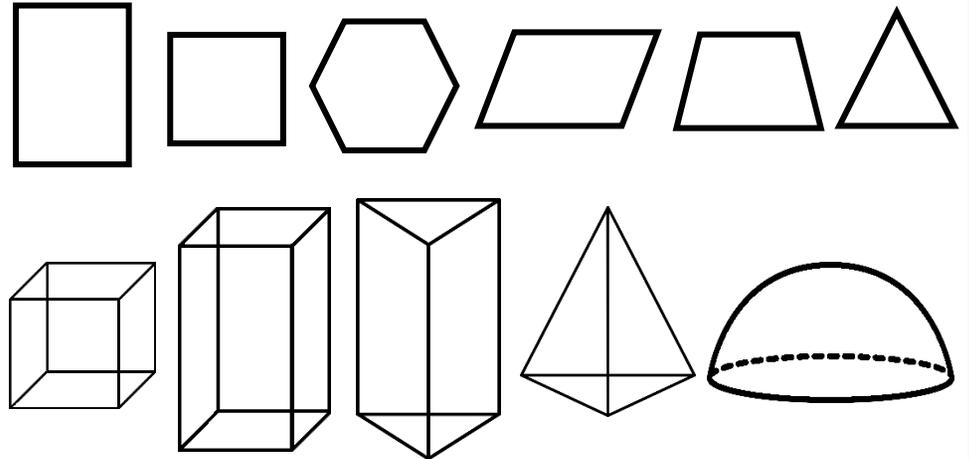
Name: _____

MY BLUEPRINT



Draw a picture of your structure.

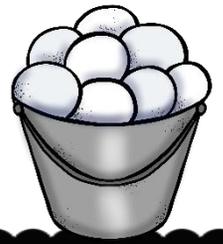
COLOR the shapes that you used in your design.
CIRCLE the shapes that were strongest.



Measure the height of your structure.

TEST 1 (15 min.)	
TEST 2 (30 min.)	
TEST 3 (45 min.)	

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?

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.

TOTAL POINTS: _____ /18

Comments: _____

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.
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Student fully participated in class discussions.	Student somewhat participated in class discussions.	Student did not participate in class discussions.

TOTAL POINTS: _____ /18

Comments: _____

STEAM 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.
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TOTAL POINTS: _____ /18

Comments: _____

STEAM 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.
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TOTAL POINTS: _____ /18

Comments: _____



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: _____



We Need

STEAM Supplies!



Dear Families,

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Sincerely,

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Parent Name(s): _____

Child's Name: _____

I am able to donate: _____

credits

created by Brooke Brown

Thank you for your purchase!

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