



In the Passport section . . .

Track your exciting journey in STEM!

Get your passport stamped when you:

Participate in STEM Pathways experiences.

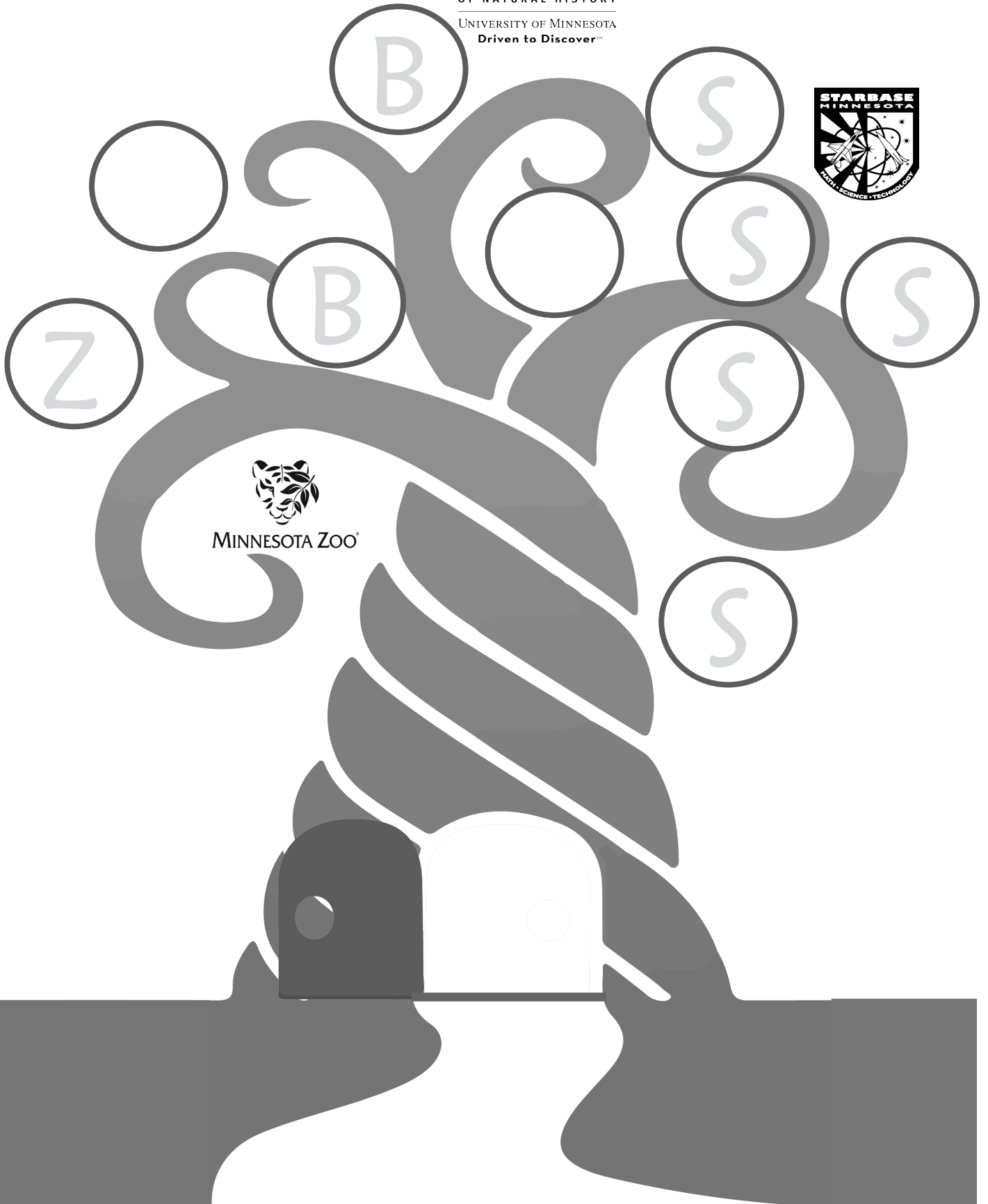
Reflect about your STEM Pathways experiences.

Think about your future in STEM.

My STEM Pathways Experiences

BELL MUSEUM
OF NATURAL HISTORY

UNIVERSITY OF MINNESOTA
Driven to Discover™



MINNESOTA ZOO®

My STEM Pathways Career Log

What do YOU want to do? YOU can do anything!

You will learn about many different
STEM careers through your
STEM Pathways experiences.

Track the careers that are most
exciting to ***YOU!***

Name of Career:

What do you find interesting about this career?

What questions do you have about this career?

Name of Career:

Why do you find interesting about this career?

What questions do you have about this career?

Name of Career:

Why do you find interesting about this career?

What questions do you have about this career?

My STEM Pathways Career Log

Name of Career:

Why do you find interesting about this career?

What questions do you have about this career?

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What questions do you have about this career?

Name of Career:

Why do you find interesting about this career?

What questions do you have about this career?

STEM Reflection - The Minnesota Zoo

What do you remember about your experience with the Minnesota Zoo?

I will always remember...



MINNESOTA ZOO®

because...

How did you use or observe STEM with the Minnesota Zoo?

What is something you learned at the Minnesota Zoo?

How do you think the Minnesota Zoo experience will help you in 5th grade and in your future?

My experience with the Minnesota Zoo will help me...

Describe a career you learned about or observed at the Minnesota Zoo.



STEM Reflection - STARBASE Minnesota



What do you remember about your experience with STARBASE Minnesota?

How did you use or observe STEM at STARBASE Minnesota?

What is something you learned at STARBASE Minnesota?

I learned...

Describe a career you learned about at STARBASE Minnesota.

What are some skills you learned or practiced at STARBASE that could help you in this career?



STEM Reflection - The Bell Museum

BELL MUSEUM
OF NATURAL HISTORY

UNIVERSITY OF MINNESOTA
Driven to Discover™

What do you remember about your experience at The Bell Museum?

I will always remember...

because...

How did you use or observe STEM with The Bell Museum?

I used or observed STEM when...

What is something you learned at The Bell Museum?

How do you think your Bell Museum experience will help you in 5th grade and in your future?

Why do you think your teachers wanted you and your class to visit The Bell Museum?



Science in STEM Pathways



Scientists use a creative process to ask and investigate questions about the world around them.

Describe a process you used during your STEM Pathways experience.

How did you use technology, engineering, or math in this process?

Science
Technology
Engineering
Math

Draw a picture of a process you used as a scientist during your STEM Pathways experience. Label the parts of your process.

A large, empty rectangular box with rounded corners, intended for a student to draw a process they used as a scientist. The box is outlined with a thin black border and occupies the bottom half of the page.

Technology in STEM Pathways



What do you think about when you read the word technology?

When I read the word technology I think about...

Sometimes we think technology is only things like cell phones and computers.
Technology can be so many things!
Technology can be anything we create to meet a need or want.

How did you use or observe technology during your STEM Pathways experience?

Draw a picture of two examples of technology from your STEM Pathways experience. Make sure at least one example is something that **doesn't** have batteries, a cord, or a screen!

Technology Example 1

What did you draw?

How is this an example of technology?

I drew...

I think this is technology because...

Technology Example 2

What did you draw?

How is this an example of technology?

Why do you think technology is important to the other parts of STEM?

Science
Technology
Engineering
Math

Engineering in STEM Pathways



Engineers are inspired to make things better.
They identify problems and then work to design a solution to meet human needs and wants.

Think about an engineering problem you learned about or solved during your experience.
Describe the problem below.

Draw a picture of the idea, invention, or solution that solved this problem.

As an engineer, what inspires you? Describe a problem you would like to solve.

How did the other parts of STEM help you to be a successful engineer?

Science
Technology
Engineering
Math

Math in STEM Pathways

Math is a vital tool for scientists and engineers as they work to answer questions and solve problems.



How did you use math during your STEM Pathways experience?

Describe the math skills you used.	How did this math help you learn something new or solve a problem?

How can you imagine using math in your future STEM experiences?



In the Activities section . . .

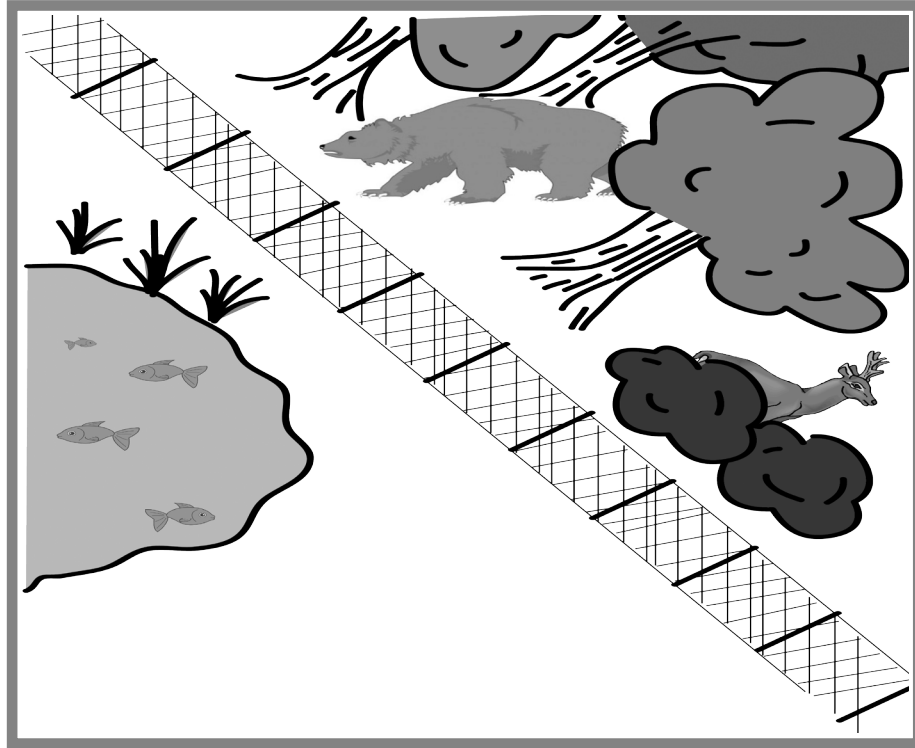
Showcase how you do STEM!

*To earn stamps, complete the activities from STEM Pathways partners,
do STEM in school, or do STEM on your own.*

Add your own STEM pages to this portfolio!



A Season for Change



Look at the picture above.

Someone has decided to build a fence through the middle of this habitat. Analyze how this fence will affect the different animals that live here.

How will a fence affect this habitat?

List three specific organisms that will be affected by the fence.

1. _____
2. _____
3. _____

Think about how the fence will affect these organisms in a week, month, or year.

Describe the long term impact the fence will have on the habitat.

I think the long term impact of the fence...

What are some other ways people change an animal's habitat?

People change an animal's habitat by...



Eat Like a Bird

Question: How does the natural design of a bird's beak affect what the bird is able to eat?

Materials Needed: Clock or timer, plate or bowl, and some of the items below.

Beaks

Pick one item from each beak category.

Beak 1



clothespin, binder clip, pliers, tweezers

Beak 2



spoon or scoop

Beak 3



toothpick or paperclip (straightened)

Bird Food

Choose at least two items from each category.

Small "insects" or "seeds"

rice, sprinkles, small cereal, seeds, oatmeal, popcorn kernels, pieces of string

"Fruit"

marshmallows, raisins, fruit snacks

Other items

noodles, beads, your own ideas

Conduct Your Experiment:

1. Combine the "bird food" in a bowl or on a plate.
2. Set a timer for 20 seconds or use a clock. Using your first "beak," try to "eat" or pick up as many food items as possible in that time. Count and record the number of items you can pick up with each "beak."
3. Repeat the experiment a second time with each beak and record your data below.
4. Observe which beak works best for the different types of items and which type of beak allows the bird to eat the most food in the shortest amount of time.

Beak 1



Beak 2



Beak 3



Trial 1			
Number of Items			
Trial 2			
Number of Items			

Share Your Observations:

1. Describe the types of food you were able to pick up with each beak.



Beak 1 - *I was able to pick up ...*



Beak 2 -






Beak 3 -

2. Which type of beak will allow the bird to eat the greatest variety of food?

I think...

because...

Use Your Observations to Make a Prediction:

3. Birds with a beak similar to beak 3  live in an area. Birds with a beak similar to beak 2  moved into the area. How will the new birds affect the food supply for birds with beak 3  ?

I think...

because...

Soaring



Engineers are inspired to make things better.

What's the Problem?

The standard glider flies well, but how can you make it fly farther?



Explore

Build the standard glider and test it, making observations about its flight.

You Need:

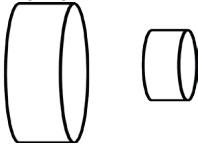
straws, paper, tape, and a ruler

Build and Test the Standard Glider

1. Cut one long strip of paper and one short strip of paper.



2. Tape the paper to make two loops, a big loop and a small loop.



3. Tape a loop to each end of the straw.



4. Try It Out!

Fly your glider, throwing it with the small loop forward.
Measure the distance.

My glider flew _____.

Be the Engineer!

How can you redesign your glider to fly a greater distance?

Before redesigning the glider, experiment with changing different parts.

Change **one thing** about the glider at a time and test the glider.

Ideas: move loops, add loops, take away loops, add straws

Glider Observations

Variable	How did this change affect the flight of the glider?
What one thing did you change?	

Redesign

Think about what you learned as you changed parts of your glider.
How can you design a glider to fly farther than the standard glider?

Sketch your glider design here.

Create, Try it Out, and Make It Better!

Build another glider according to your plan and test it, comparing your new glider to the standard glider. Keep redesigning and testing your glider until you have created a glider that flies a greater distance than the standard glider.

How did you design your glider to fly farther than the standard glider? What helped your design?

What inspires the engineer inside you?

Think about your everyday life and the things you use each day. **What would like to redesign? How would you make it better?** I want to redesign...

because...

I would make it better by...



Design a Cargo Boat

Your Engineering Challenge:

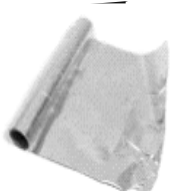
Problem: Design a boat that can hold as much cargo (number of pennies) as possible!



Gather Your Materials



ruler



aluminum foil



scissors



pennies



sink, tub, or other container filled with water

Design a Prototype

Cut a 6 inch by 6 inch square of foil.



Think about how you can fold and mold the foil to make a boat that can hold a lot of cargo (pennies).

Sketch your plan here

After planning your design, build your boat!

Test and Evaluate Your Prototype

How many pennies did your boat hold? _____

Think about any problems with your design. How can you redesign your boat to hold more pennies?

Redesign your boat to make it hold more pennies.

Test your new design - What did you change? How well did it work? _____

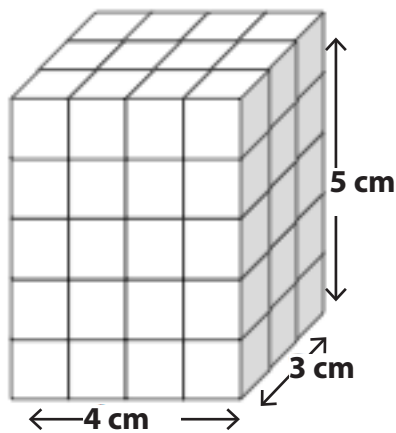
Tight Spaces

You are going to Mars! You are allowed to take three things from home with you. You can choose any item, but it must be in a box or rectangular prism. You can choose to bring things like your favorite food (such as cereal, crackers, or macaroni and cheese), favorite movie, or a toy. If you choose to bring an item that's not rectangular like a teddy bear, make sure you place it in a box first! Space is tight in the rocket. You have $18,000 \text{ cm}^3$ of volume available on the rocket to store your items.

What is volume?

Volume is the amount of 3D space of an object.

Look at the box below. The volume is the total number of cubes that make up the box.



How do you find the volume of a box?

1. Find the area of the Base.

$$\begin{array}{r} 4 \text{ (length)} \\ \times 3 \text{ (width)} \\ \hline 12 \text{ cm}^2 = \text{Base area} \end{array}$$

2. Multiply the Base area by the height

$$\begin{array}{r} 12 \text{ (Base area)} \\ \times 5 \text{ (height)} \\ \hline 60 \text{ cm}^3 = \text{volume} \end{array}$$

Find the Volume of Your Items

1. Measure and record the length, width, and height of your boxes.

You can use the ruler on the edge of this paper.

Item 1: _____

length = _____ cm

width = _____ cm

height = _____ cm

Item 2: _____

length = _____ cm

width = _____ cm

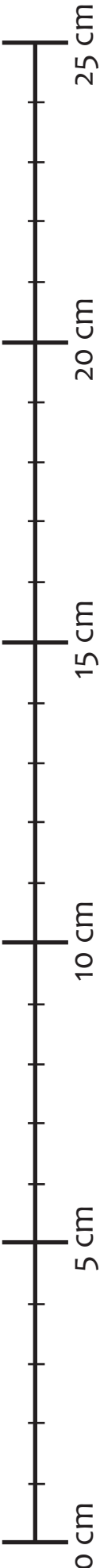
height = _____ cm

Item 3: _____

length = _____ cm

width = _____ cm

height = _____ cm



3. Calculate the volume of Item 1.

What is the area of the Base?

(length)
x (width)

$\text{cm}^2 = \text{Base area}$

Multiply the Base area by the height to find the volume.

(Base area)
x (height)

$\text{cm}^3 = \text{volume}$

4. Use what you just learned about volume to calculate the volume of your 2nd Item.

x _____
 $\text{cm}^2 = \text{Base area}$

x _____
 $\text{cm}^3 = \text{Volume}$

5. Calculate the volume of your 3rd Item.

x _____
 $\text{cm}^2 = \text{Base area}$

x _____
 $\text{cm}^3 = \text{Volume}$

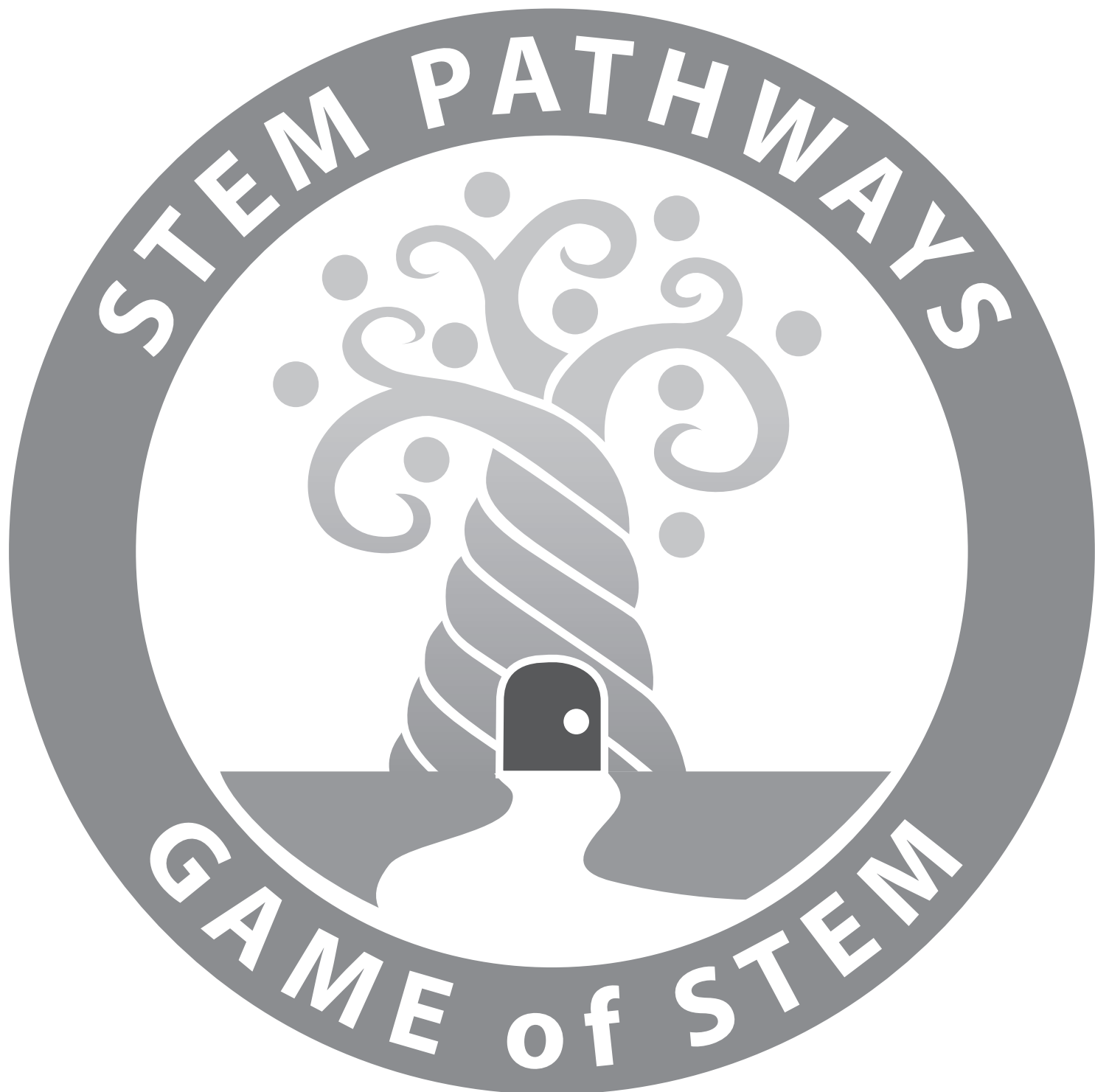
6. The volume of space available to store your boxed items on your rocket is $18,000 \text{ cm}^3$. Add the volumes of your three items together.

_____ = Total Volume

Do all three of your items fit in your rocket?

Yes (circle one) **No**

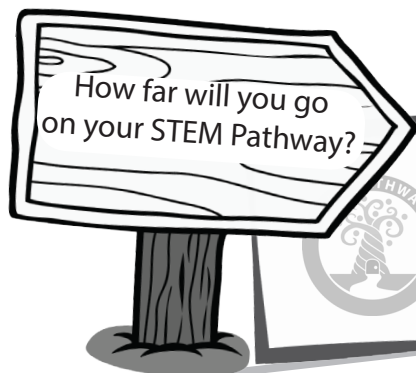
7. If you said No, how could you solve that problem? If you said Yes, how much room was left over? _____



Play the Game of STEM

The Game of STEM is a fun way for you to track the STEM you do throughout the school year as part of the STEM Pathways experiences, in your classroom and on your own. As you participate in STEM, your teacher will stamp your Game of STEM board with a STEM Pathways stamp. You can receive stamps for your STEM Pathways experiences, completing activities in this binder, or any other STEM stuff you complete in or out of school that your teacher wants to recognize. As you receive stamps on your board, you can total your points and increase your level of STEM. As you increase your levels of STEM, you'll earn certificates and other recognition from your teacher. Good luck and have fun this year in STEM!

The Game of STEM



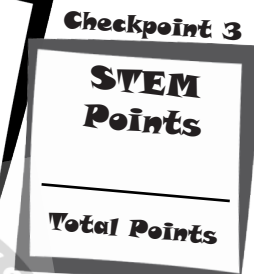
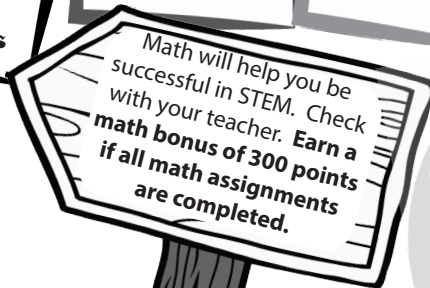
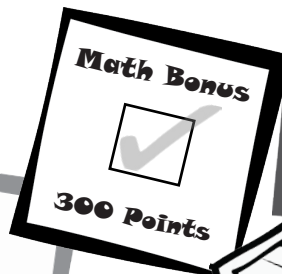
Think about the STEM experiences you have participated in at school.
Describe or draw a picture of your favorite one.

Checkpoint 1

**STEM
Points**

Total Points

Whenever you reach
a STEM Points square,
calculate the total STEM
Points you've earned.
**You earn 50 points
per stamp.**



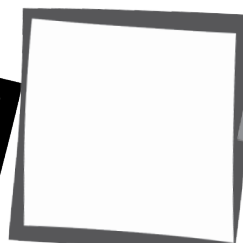
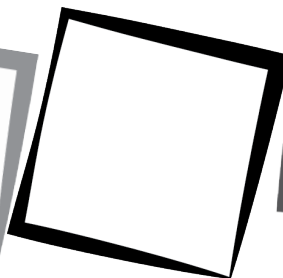
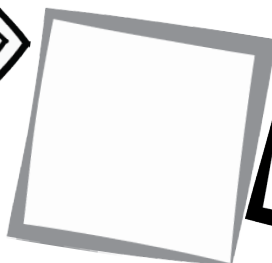
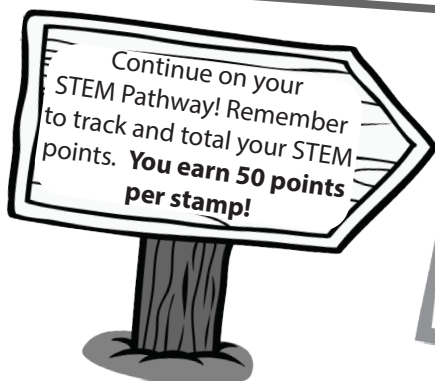
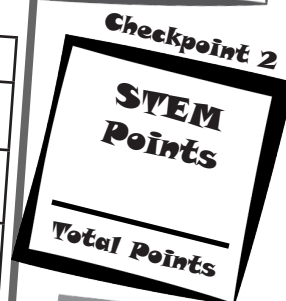
Google Earth has a ruler you can use to measure distances in a variety of units such as meters, kilometers, and miles. You can also measure in smoots. A smoot is a unit of measurement created by Oliver Smoot. The length of a smoot is the same as Oliver Smoot's height. He used his own body to create a unit of measurement. He and his friends measured the entire length of the Boston Bridge in smoots.

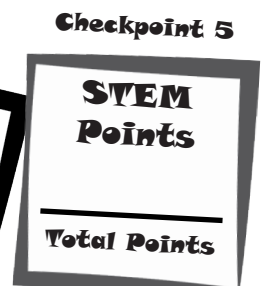
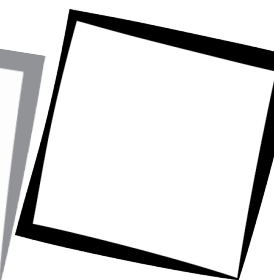
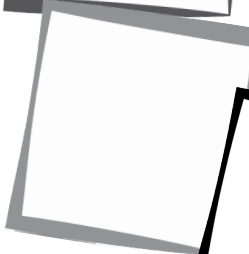
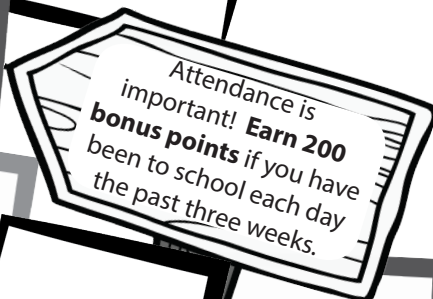
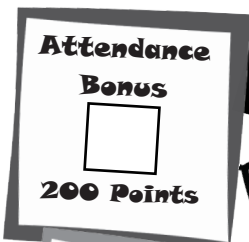
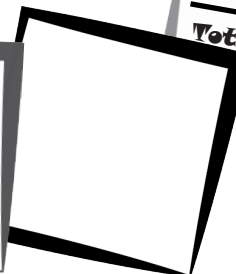
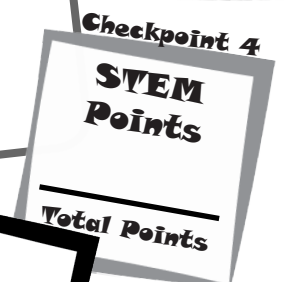
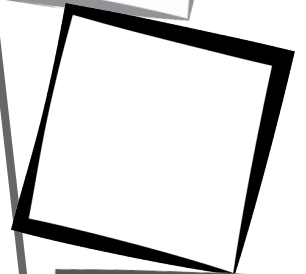
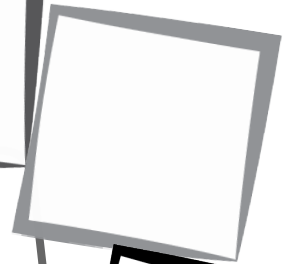
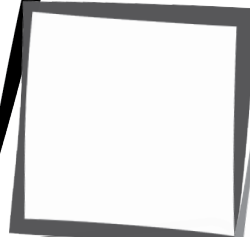
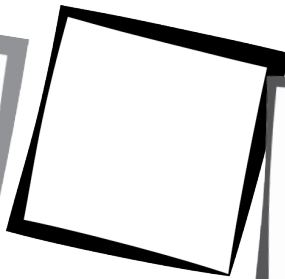
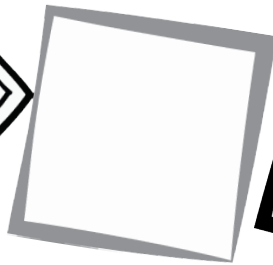
Use yourself, or a part of your body, as a unit of measurement. Measure the length or distance of things in and around your house, neighborhood, or school.

1. What did you use as a unit of measurement? _____

What did you measure?	Measurement (label the units!)
1.	
2.	
3.	

Earn a stamp for completing this activity!





One of the keys to a successful future is a great career. The best careers are built on what you already enjoy. Think about your STEM experiences this year.

What did you enjoy the most?

Draw a picture or describe your best STEM experience of the year.

Motivation Bonus

☐

300 Points

How motivated are you?
If you have completed an extra STEM activity outside of school, earn a **STEM bonus of 300 points**.



Checkpoint 7

STEM Points

Total Points

Checkpoint 6

STEM Points

Total Points

Some of the most exciting technology is in the form of apps for a phone, tablet, or computer. Do you have an idea for the next great app?

What is the goal of your app?

Who will the audience be? Who do you think will buy it?

Describe how your app will work.

Continue on your STEM Pathway! Remember to track and total your STEM points.
You now earn 100 points per stamp!

The Game of

STEM

I reached **Level 5** on
date: _____

Level 5
4,000 points and above

I reached **Level 4** on
date: _____

Level 4
3,000-3,999 points

Level 3
2,000-2,999 points

I reached **Level 3** on
date: _____

Level 2
1,000-1,999 points

I reached **Level 2** on
date: _____

Level 1
0-999 points

I have started my
Game of STEM at **Level 1**!

