



In the Passport section . . .

Track your exciting journey in STEM!

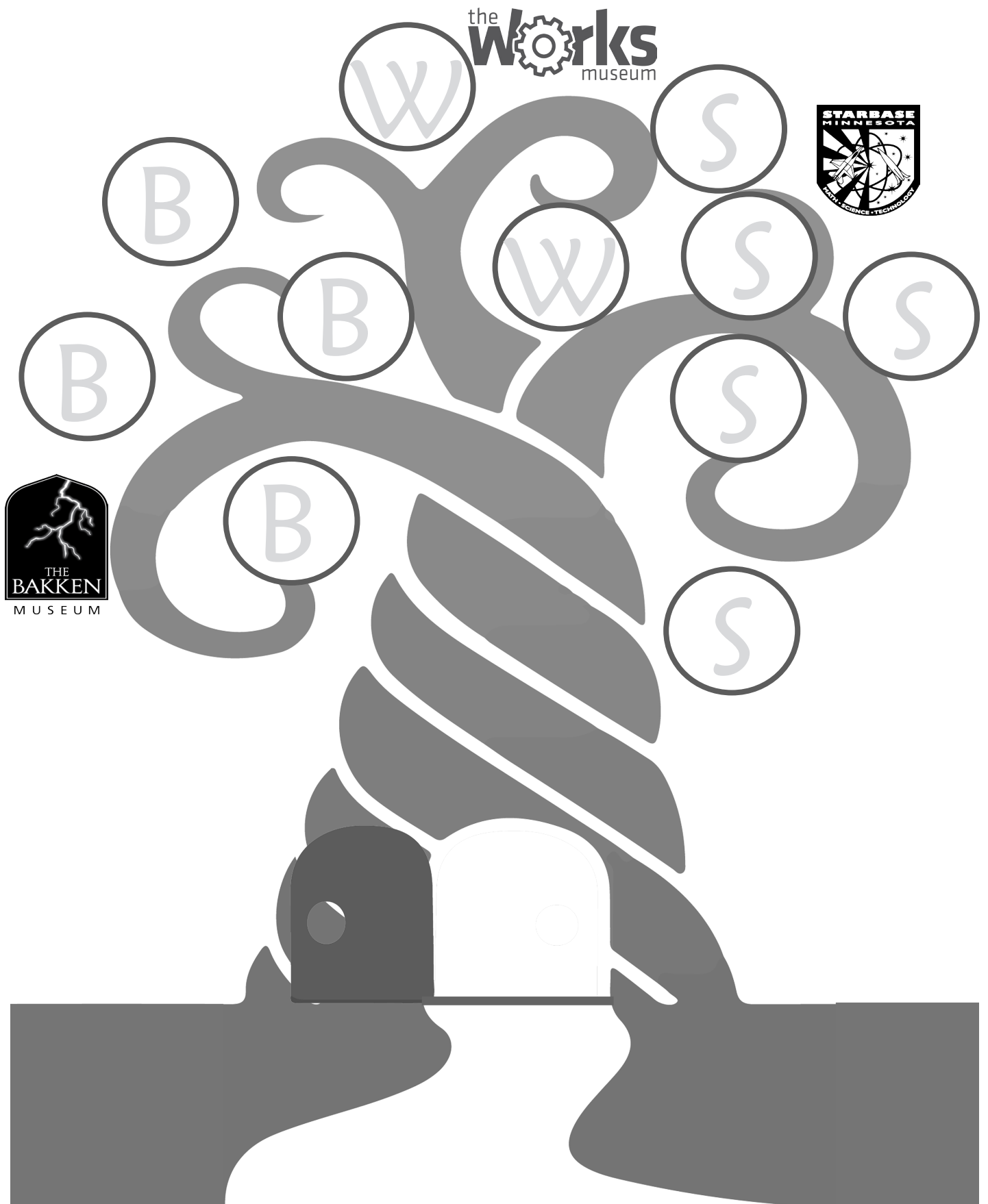
Get your passport stamped when you:

Participate in STEM Pathways experiences.

Reflect about your STEM Pathways experiences.

Think about your future in STEM.

My STEM Pathways Experiences



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:

What do you find interesting about this career?

What questions do you have about this career?

Name of Career:

What do you find interesting about this career?

What questions do you have about this career?

My STEM Pathways Career Log

Name of Career:

What do you find interesting about this career?

What questions do you have about this career?

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Name of Career:

What do you find interesting about this career?

What questions do you have about this career?

STEM Reflection - The Bakken Museum



What do you remember about your experience with The Bakken?

I will always remember...

because...

What was your favorite part of doing STEM with The Bakken?

My favorite part of doing STEM with the Bakken was...

What is something new that you learned with The Bakken Museum?

Why do you think your teachers wanted you and your class to visit the Bakken Museum?

Describe a career you learned about at The Bakken Museum.



STEM Reflection - The Works Museum

What do you remember about your experience with The Works?

I will always remember...



because...

What was your favorite part of doing STEM at The Works?

What is something new you learned at The Works?

How do you think The Works experience will help you in 4th grade and in your future?

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

I think my teacher wanted me to experience The Works because...



STEM Reflection - STARBASE Minnesota



What do you remember about your experience at STARBASE Minnesota?

What was your favorite part of doing STEM at STARBASE Minnesota?

What is something new you learned at STARBASE Minnesota?

I learned...

Describe a STEM career you learned about at STARBASE Minnesota.

I think...

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



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 white and has a thin black border.

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 do you think you will use math in 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!



Magnetic Force

What is an electromagnet?

An electromagnet is a magnet that runs on electricity.
It can be turned on and off and made stronger and weaker by controlling the current.
You can even reverse the poles!

Build an Electromagnet

1. Gather your supplies.

Open your Bakken Kit and take out these materials:

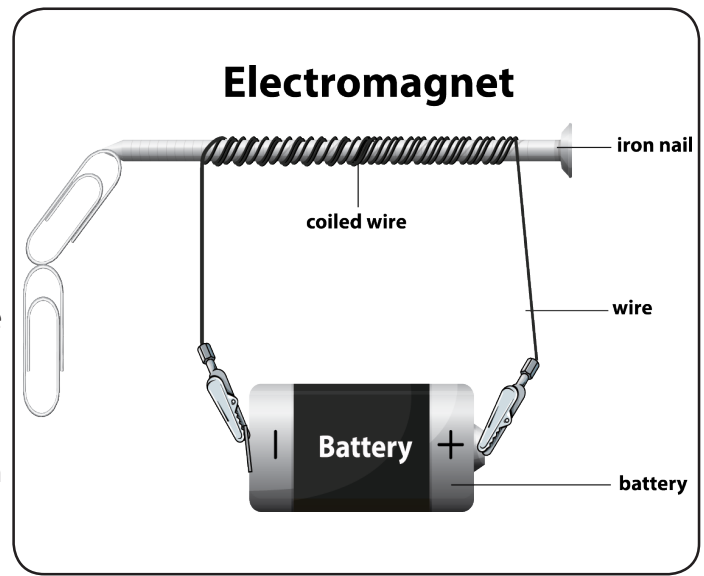
1. insulated wire with clips
2. nail
3. battery

2. Wrap insulated wire around the nail.

Wrap the wire tightly around the nail, keeping the loops close together or even overlapping.

3. Connect wire to the battery.

Attach one clip to the tab on the battery and touch the other clip to the opposite side.



Just like an engineer . . .

You will need to find the best way to wrap the wire or attach the battery to make your electromagnet work.
Keep trying until you're successful!

Test Your Electromagnet!

See if the nail can now pick up paper clips as shown in the picture.

Remember! Electricity is flowing through the wire. This can make the battery feel hot. If it gets hot, disconnect the wires from the battery for a few minutes.

Think Like an Engineer

As an engineer, it is important to know why different parts are included in a design.

Why do you think the electromagnet needs a battery? *I think the electromagnet needs a battery because...*

Why do you think the electromagnet uses an iron nail? *I think...*

Congratulations! You created an electromagnet!

Think like a scientist! Look at your your electromagnet.

How strong is your magnet?

Is your Bakken magnet or your electromagnet stronger?

What else do you wonder about the electromagnet?

Brainstorm some of your questions below.

My Questions

1. *How many paperclips can you pick up?*

2. *Is your Bakken magnet or your electromagnet stronger?*

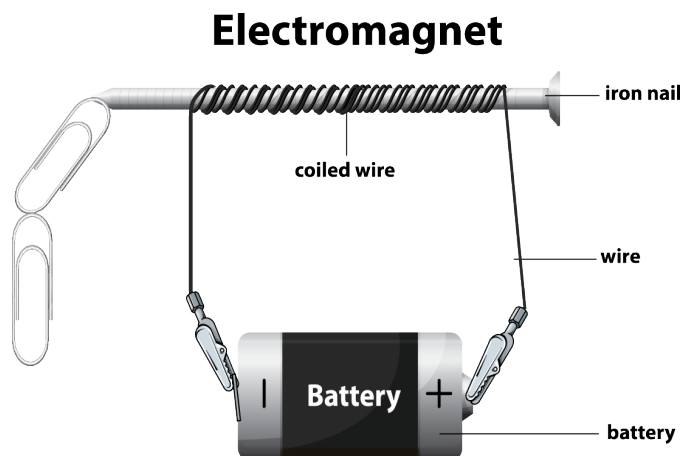
3.

4.

5.

Choose a question from above that interests you. What investigation can you do to answer your question? Describe your investigation below.

Did you try your experiment? If so, share your results here. If you didn't try your experiment, use the space below to predict what you think would happen if you did.





Butter Races

Heat moves, or transfers, through some materials better than others. Conductors transfer heat quickly. **Insulators** transfer heat slowly.

Question: Which types of materials are conductors and which are insulators?

Materials Needed:

Using these materials you can decide which types of materials are conductors and insulators of heat.



butter



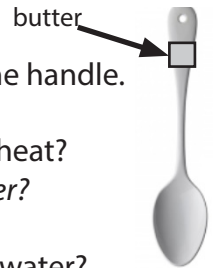
wooden craft stick, metal spoon, plastic spoon



glass of
hot water

Set up your experiment:

1. Place the craft stick, plastic utensil, and metal utensil in a line on your table.
2. Put a pad (small amount) of cold butter on each item, about 1 inch from the top of the handle.



Think about the question: Which materials are conductors and which are insulators of heat?

Hint: If a material is a **conductor of heat**, will it get hotter faster or stay cooler longer?

Make a prediction. What will happen when you put the craft stick and spoons into hot water?
Which pad of butter will melt the fastest? I think...

Conduct your experiment: Fill your glass with hot water. Carefully place all of the items into the water and observe. Keep the handles and butter out of the water!

Share Your Results!

Which material was the best conductor of heat? _____

Which material was the best insulator of heat? _____

Think about the materials you tested and answer this question. You need to stir a large pot of hot soup.

Which type of spoon would you use, a wooden, metal, or plastic spoon? Why?

I would use a _____ spoon 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:

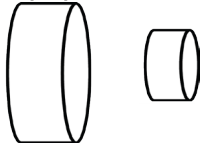
straws, paper, tape, and a ruler

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...

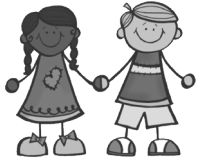
I would make it better by...

Program a Person

Technology exists in many different forms.

One form of technology is robotics. A robot follows a process, or program to complete a task. Design a program for a person to follow to complete a task.

Gather Your Materials



two friends



blindfold



Define the Task

Program a person to travel from

_____ to _____.



Test the Program

Put the blindfold on your friend, spin them three times, and tell them the program one step at a time.



Rewrite the Program

Did your program work well? How can you make it better? Edit the steps to your program and ask the **other friend** to test it.



Write Your Program - List the steps your friend must follow to travel from one spot to another.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.

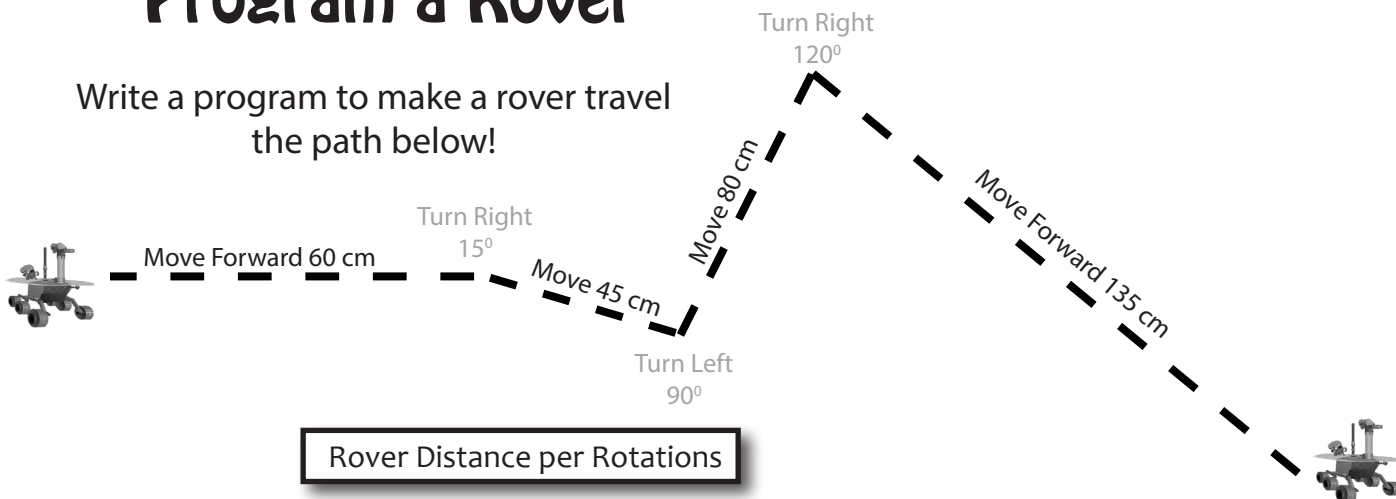
Use more paper if needed.

Analyze Your Program

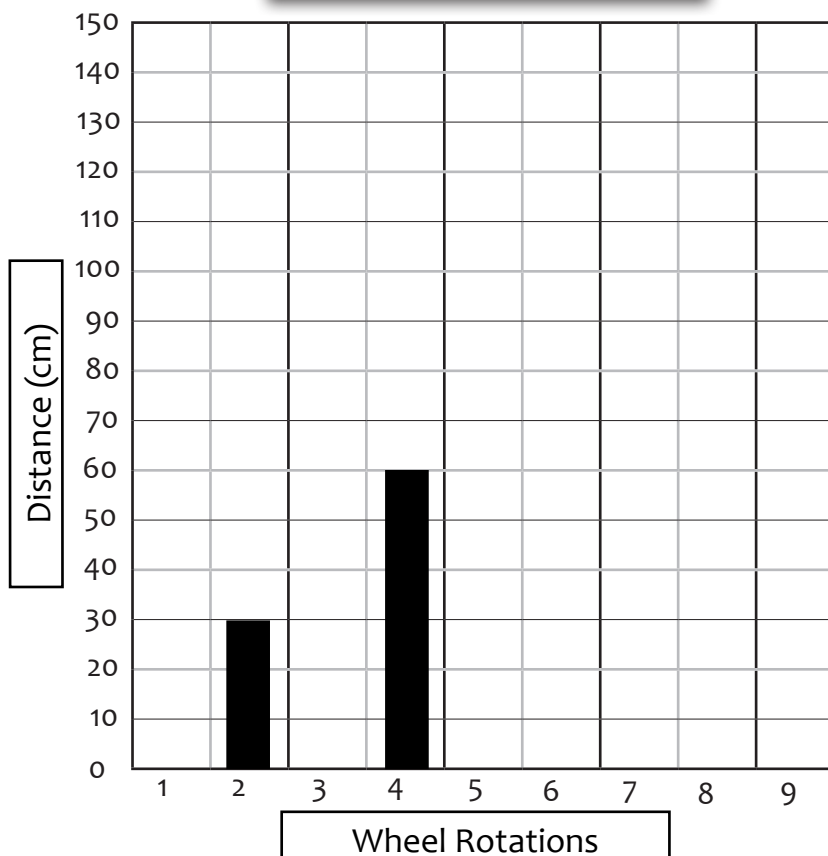
Describe the improvements you made to your program and why.

Program a Rover

Write a program to make a rover travel the path below!



Rover Distance per Rotations



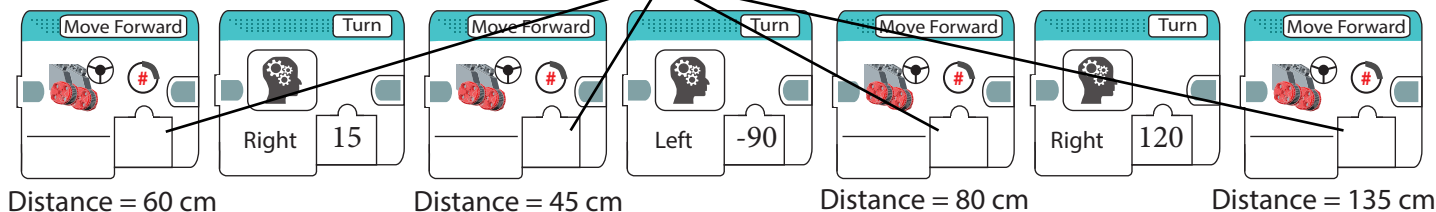
Step 1 - Fill in Missing Data

Use the data provided to predict the distance the rover will travel at 1, 3, and 5 wheel rotations. Fill in the table and create bars on the graph.

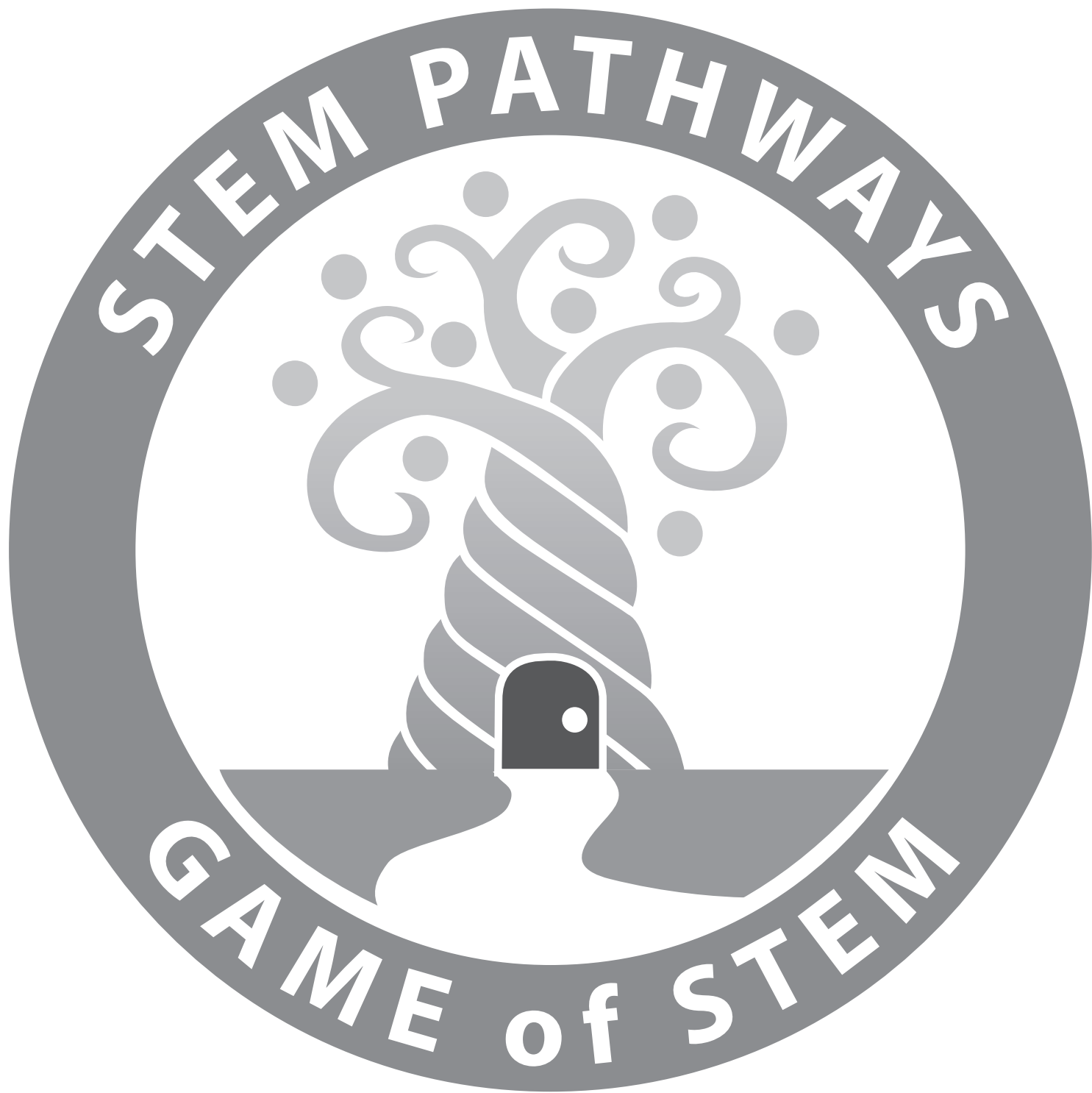
Rover Wheel Rotations	Distance
1	
2	30 cm
3	
4	60 cm
5	

Step 2 - Write the Program. Use the graph to predict the rotations needed to travel the required distance.

Write the predicted rotations here!



How would your program change if you put larger wheels on your rover? _____

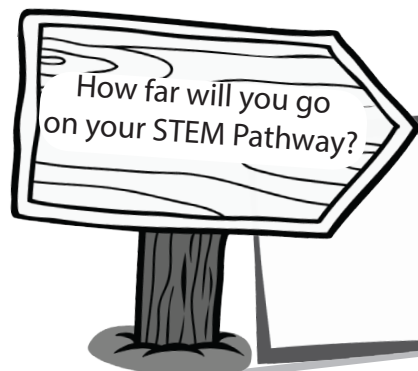


Play the Game of STEM

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



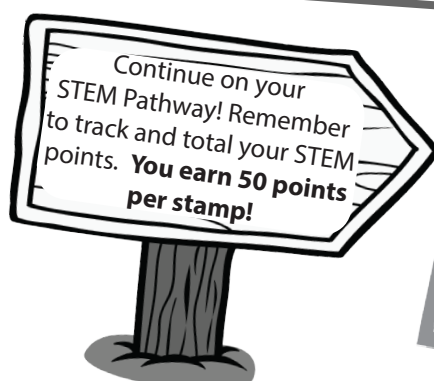
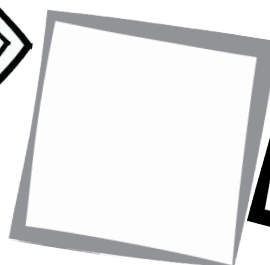
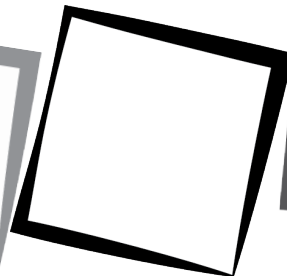
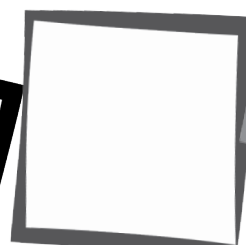
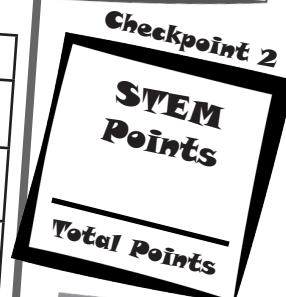
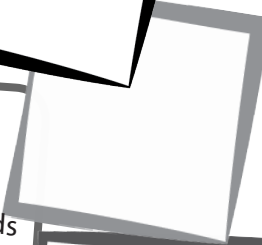
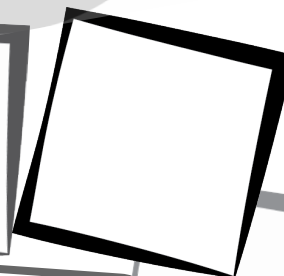
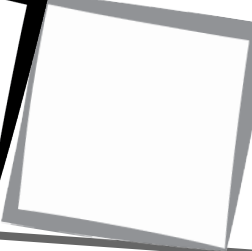
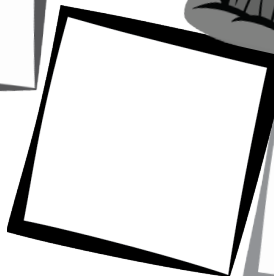
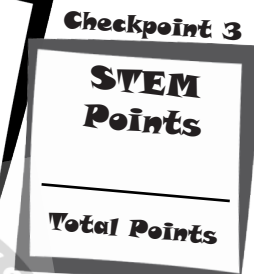
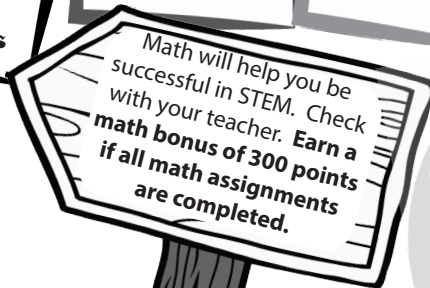
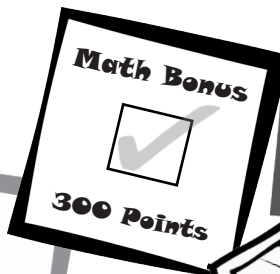
Think about the STEM experiences you have participated in at school.
Describe or draw a picture of your favorite one.

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.**



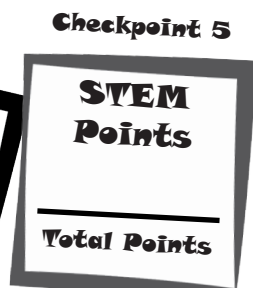
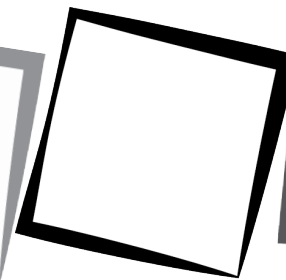
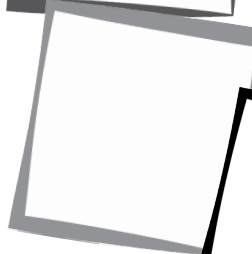
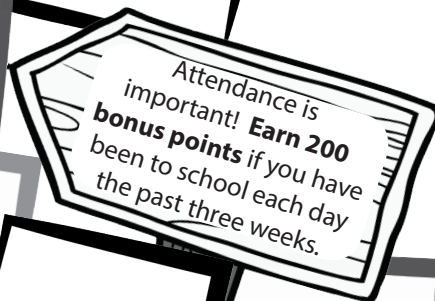
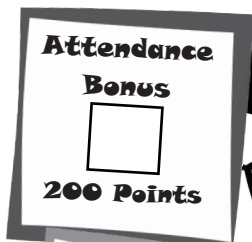
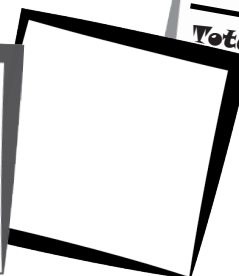
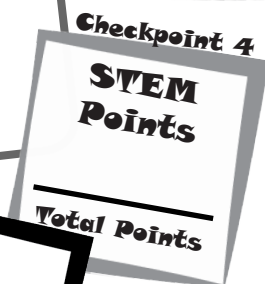
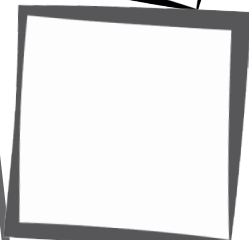
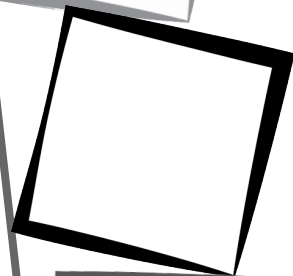
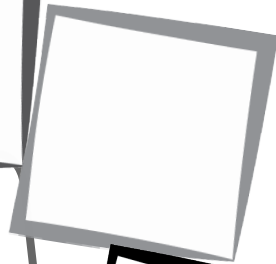
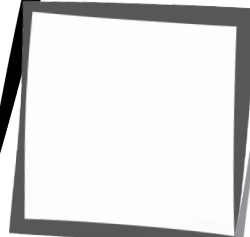
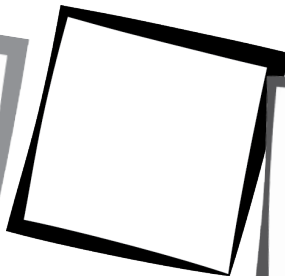
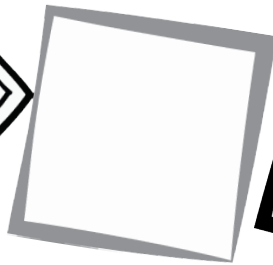
Google Earth has a ruler you can use to measure distances in a variety of units such as meters, kilometers, and miles. You can also measure in smoots. A smoot is a unit of measurement created by Oliver Smoot. The length of a smoot is the same as Oliver Smoot's height. He used his own body to create a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

