



# QWQED



**Grades K - 2**



## Day 1 Introduction to Friction Ramps

### English Language Arts

**Friction is a force that slows how an object moves. Write about/draw where you've seen friction in action.**



## Day 1 Introduction to Friction and Ramps

### Math

**YOU CHOOSE** 

Survey your family and place a tally mark in their favorite activity.

Activity 1	
Activity 2	
Activity 3	

# Day 1 Introduction to Friction and Ramps

## Science

### Sudsy Discoveries

Let's create our own friction...

1. Rub your hands together. We learned that when two objects rub together, they create friction.
2. Now, wash your hands with soap and water. Do the soap suds create more or less friction?
3. Explain.



# Day 1 Introduction to Friction and Ramps

## Social Studies

Look around your home or community. Do you see any ramps? Is there a place in your home or community that could use a ramp to help in some way? Discuss this with a family member.



## Day 2 Surface Investigation

### English Language Arts

Imagine that you live somewhere sandy, icy, or rocky. Write/draw how friction would affect how you moved on the surface. See if you can use the words **friction**, **surface** or **investigate** in your sentence.

"I live where it is \_\_\_\_\_."

Add a sentence of your own and illustrate if you'd like.

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## Day 2 Surface Investigation

### Math

Look at the predictions that you made for the Science activity.

Cut out the surface material cards and put them in order from the surface with the least amount of friction to the one that creates the most friction.

Keep these cards handy. You'll use them again on Day 6.







## Day 2 Surface Investigation

### Science

Take a look at the different surface materials you have. Make predictions about which ones will create the most friction and which ones will create the least amount of friction.

See if you can use some words to describe how the surfaces feel --- smooth, bumpy, sticky...

The \_\_\_\_\_ feels \_\_\_\_\_.

The \_\_\_\_\_ feels \_\_\_\_\_.

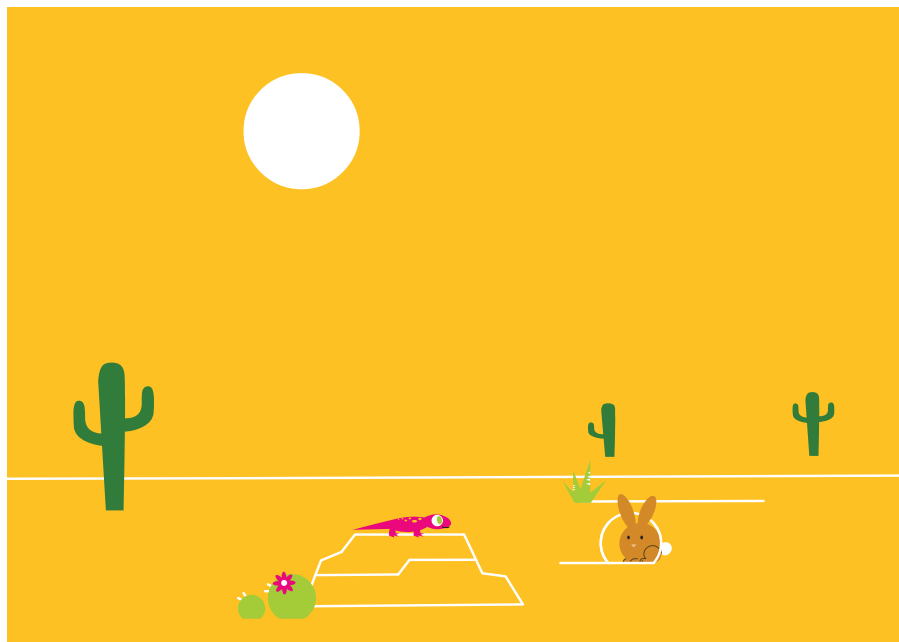
The \_\_\_\_\_ feels \_\_\_\_\_.

## Day 2 Surface Investigation

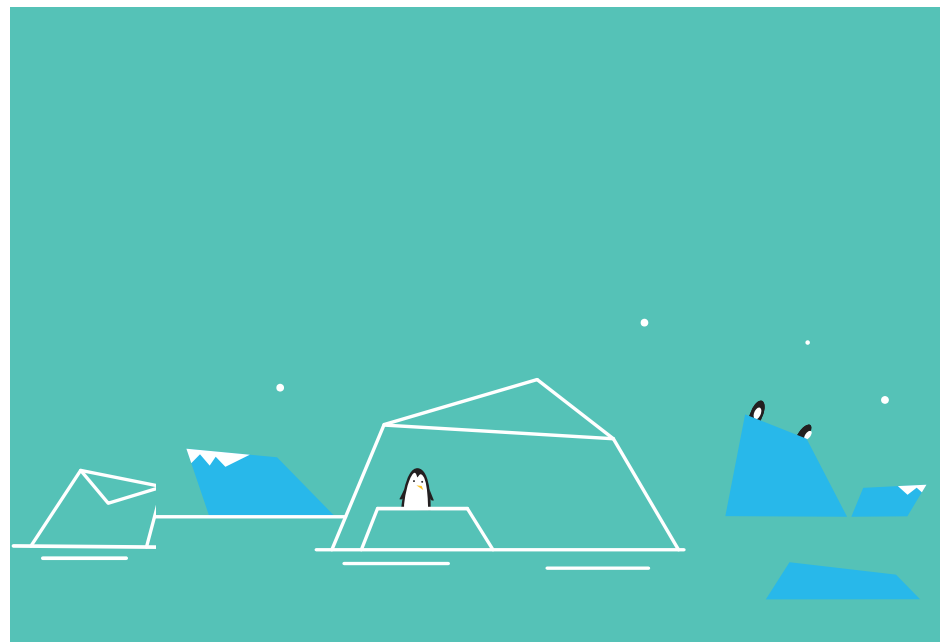
### Social Studies

Think about different places in the world that have different surfaces. For example, the desert is made of mostly sand. How would that affect the way you'd move across that surface? What if you lived somewhere cold or icy like the arctic? Draw what these places would look like

#### Desert



#### Arctic



## **Day 3 Ramp Construction**

### **English Language Arts**

Based on the construction of your ramp, write your predictions of which surface will make the car stop, go really far, or somewhere in between.

Use the attached sheets to record your observations and predictions.



# Friction Frenzy Surface 1

Material Used: \_\_\_\_\_

## Observations

OBSERVE

where have you seen  
**THIS MATERIAL**  
before?

## Predictions

HOW FAR  
do you think  
the car will  
GO?  




# Friction Frenzy Surface 2

Material Used: \_\_\_\_\_



**Observations**

**Predictions**

DESCRIBE the  
**TEXTURE**  
of this surface

DO YOU THINK  
**THE CAR**  
WILL MOVE  
VERY FAR?

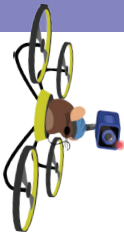
KEEP USING  
THAT  
**BRAIN!**



# Friction Frenzy Surface 3

Material Used: \_\_\_\_\_

## Observations



TOUCH EACH SURFACE...  
HOW DO THEY  
FEEL?

## Predictions

???

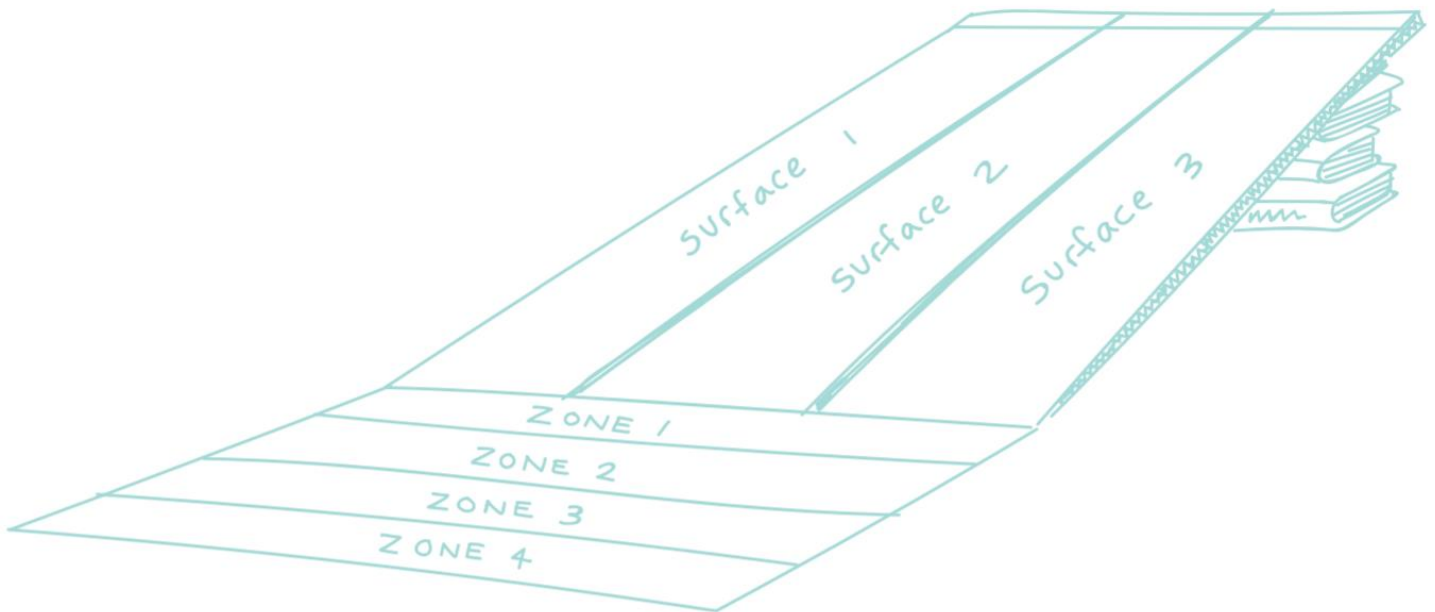


## Day 3 Ramp Construction

### Math

Lots of measuring today! Get your ruler/tape measure ready...

1. Measure how wide your board is. You'll need to figure out how many inches wide each surface lane should be so that each lane gets an equal width of the ramp.
2. Starting at the foot of the ramp and moving away from the ramp, tape lines 6 inches apart to serve as distance lines to help measure how far your car travels. You can mark the space between the lines as "zones" if you'd like, as the diagram shows.

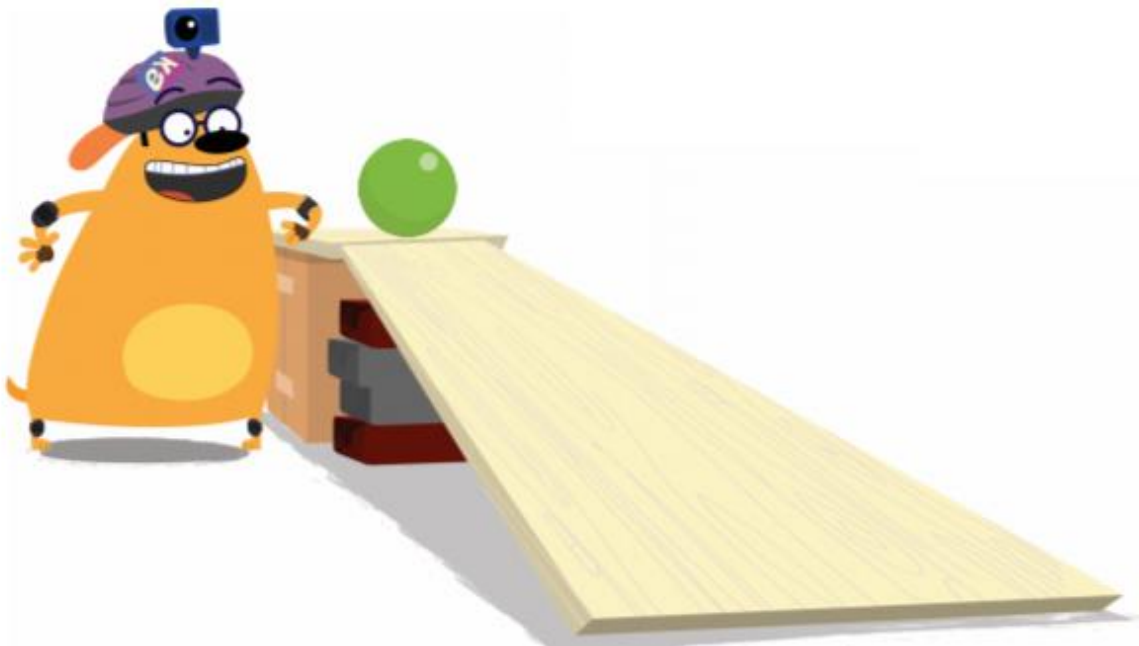


# Day 3 Ramp Construction

## Science

Time to make your ramp!

1. Prop your board/cardboard up about six inches high using books or other props.
2. Select 3 different surfaces that you'd like to test.
3. Measure and cut the surface materials (see the Math section) and attach them to the ramp with clips or tape.





## Day 3 Ramp Construction

### Social Studies

Part of the Engineering Design Process is planning and designing. Draw a picture of what you'd like your ramp to look like.

### My Ramp Design



## Day 4 Testing Day

### English Language Arts

#### Friction Discoveries

What material created the least/most amount of friction? Were you surprised by any of your results? Based on your testing, write/draw about whether you predicted correctly.

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## Day 4 Testing Day Math

# Friction Frenzy Results

Measure and record the results of your testing



Surface  
**1**

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*COLLECT  
Data*

Surface  
**2**

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Surface  
**3**

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*Zoom!*

## Day 4 Testing Day

### Science

Time to run your test!

1. Place the object at the top of one of the surface sections.

Remember to hold the object steady and simply let it go...no need to give it a push.

2. Let the object go and see how far it travels.

3. Test each surface 3 times and see if you get the same results. If your results vary, discuss this with a family member.

## Day 4 Testing Day

### Social Studies

Ramps are important in many jobs. Can you think of a job that uses ramps?

Discuss these jobs with your family.

"\_\_\_\_\_ is a job that needs to use a ramp."

## Day 5 Change It Up English Language Arts

Think about what you've learned about friction this week. Use drawings and words to describe what you experienced, learned and liked about your experiences this week

I FEEL...

I OBSERVED...



## Day 5 Change It Up

### Math

### Workspace for Problem Solving

Can you draw a picture or come up with a number sentence that compares the distances that your car traveled?

For example:

If the object traveled 4 inches on the bubble wrap and it traveled 7 inches on the foil, how far did the object travel all together?

- $4 + 7 = 11$  inches



## Day 5 Change It Up

### Science

1. Change something on your ramp. You could:
  - ❖ Make your ramp higher or lower
  - ❖ Change the surfaces on your ramp
  - ❖ Use a different object
2. Run your tests again and see how that affects the distance that your car travels.



## Day 5 Change It Up

### Social Studies

Think about members of your community, such as transportation workers, athletes, construction workers, or other occupations you can think of...how does friction impact their work and what they do? Discuss this with your family and draw a picture of a worker who uses friction for their job.

## Day 6 Extending Friction to Space Travel

### English Language Arts

Close your eyes and pretend that you are in a rocketship traveling into space. Buckle in and count down... 3, 2, 1...Blast off! As you travel into space, look out the window. What do you see? Do you hear anything? What are you wearing? Draw a picture of what outer space looks like to you.



## Day 6 Extending Friction to Space Travel

### Math

#### Workspace for Problem Solving

I had 3 boxes at my house. Each box had 4 recycled objects in it. How many objects did I have all together?

Draw a picture, write a number sentence or make a table to solve the problem.



## Day 6 Extending Friction to Space Travel

### Science

Once you land on your planet, you'll need a vehicle to travel around in. Our project will be to design, build and test a rover that could travel across the surface of another planet. Use your surface material cards from Day 2 and sort them into categories on the next page -- surfaces my rover can travel over easily, and surfaces that will challenge my rover.

Lots of Friction

A Little Friction

## Day 6 Extending Friction to Space Travel

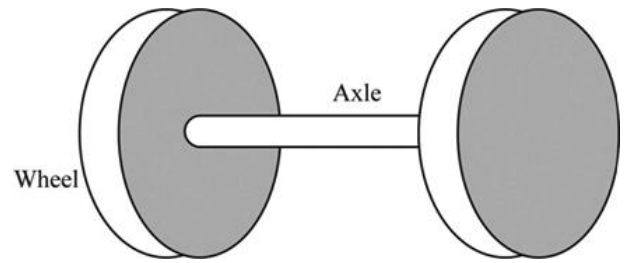
### Social Studies

For our rover project, you are going to recycle and reuse objects that you find around your house. Discuss with your family why it's important to recycle and reuse materials. Draw some of the items that you may use.

## Day 7 Wheels and Axles

### English Language Arts

The wheels of a vehicle are connected by an axle in the middle. Can you think of any jobs around your community that rely on vehicles that have wheels and axles? What are those jobs and why is it important that their vehicles are able to travel easily? Draw and write about it.



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## Day 7 Wheels and Axles

### Math

### Workspace for Problem Solving

If there were 4 cars in a parking lot, how many wheels would that be all together? Draw a picture or write a number sentence to tell how many wheels there would be.





## Day 7 Wheels and Axles

### Science

See if you can find a toy car around your house. If you don't have a toy car, look at a real car. Notice the wheels. Can you actually see the axles? How do you think wheels and axles change depending on the surface that they're traveling on? Discuss this with your family.



## Day 7 Wheels and Axles

### Social Studies

How do you think people traveled before wheels and axles were invented?  
Discuss this with your family. Write a sentence about it and illustrate.

Long ago, people traveled by \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Day 8 Design and Build Your Rover

### English Language Arts

How do you and your family travel around your community? How is your rover similar to your vehicle? How is it different?

Similar	Different

## Day 8 Design and Build Your Rover

### Math

#### Workspace for Problem Solving

If your rover travels 10 miles every day for 5 days, how many miles would it travel all together?

Draw a picture, write a number sentence or make a table to solve this problem.



# Day 8 Design and Build Your Rover

## Science

Time to build your rover!

1. Take some time to gather materials that you'd like to use for your rover. Think about items that would make good wheels and axles. Think about how the surface will affect how your rover moves.
2. Just like in real-life NASA projects, we can collaborate and ask for help if things become challenging. Feel free to collaborate with your family during this process!



## Day 8 Design and Build Your Rover

### Social Studies

Part of the Engineering Design Process is planning and designing things that can solve problems. Think about some of the problems and challenges astronauts might face as they try and travel along the surface of planets. Design a rover that would solve some of those problems and draw what it would look like.



**What I notice:**

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**What problems a Mars rover might have:**

1. 

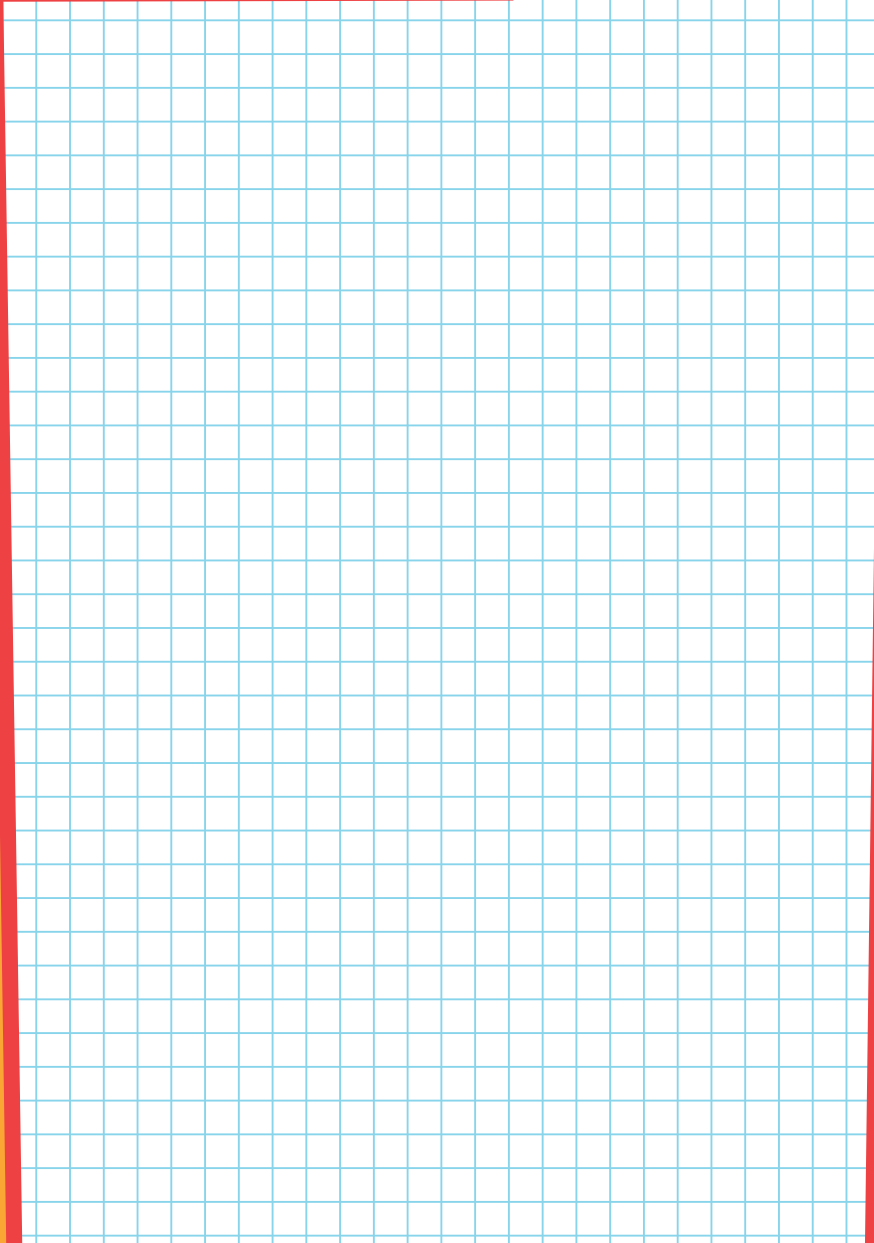
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2. 

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3. 

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**Now pick a problem that your rover design will solve!**

## My rover design



## Day 9 Testing Day

### English Language Arts

What material created the least/most amount of friction? Were you surprised by any of your results? Based on your testing, did you predict correctly on Day 6? Discuss these questions with your family and write about it.

<b>Friction discoveries</b>	
<b>This surprised me</b>	
<b>"My prediction was _____"</b>	



## Day 9 Testing Day Math

# Results

Measure the distance your rover travels on each surface and record the results of your test.



Surface

1

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Surface

2

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Surface

3

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# Day 9 Testing Day

## Science

Time to test your rover on different surfaces!

1. Gather some of the surface materials that you used on your ramp.
2. Lay the surface material flat.
3. Place your rover at the beginning of the surface.
4. Use force (one push) to move your rover.
5. Test your rover on 3 different surfaces.

## Day 9 Testing Day

### Social Studies

Create a map for your rover to follow as it travels over the surface of your planet. Start with the landmarks you think are most important.

## Day 10 Change It Up English Language arts

**Think about what you've learned about wheels, axles and force. Use drawings and words to describe what you experienced, learned and liked about your experiences.**



**My favorite thing today was...**

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## Day 10 Change It Up

### Math

Record the results of changing your rover

What I Changed	Results

## Day 10 Change It Up

### Science

Change something about your rover. You could:

- Change out the wheels
- Test it on your ramp
- You could change the force on your rover
- You could make your rover lighter/heavier

Run your test again and see how your changes affected how your rover traveled.

## Day 10 Change It Up

### Social Studies

Besides recycling and reusing things around your house, discuss with your family some other ways you can help take care of the Earth. Write/draw some of your ideas.

I can help the Earth by \_\_\_\_\_