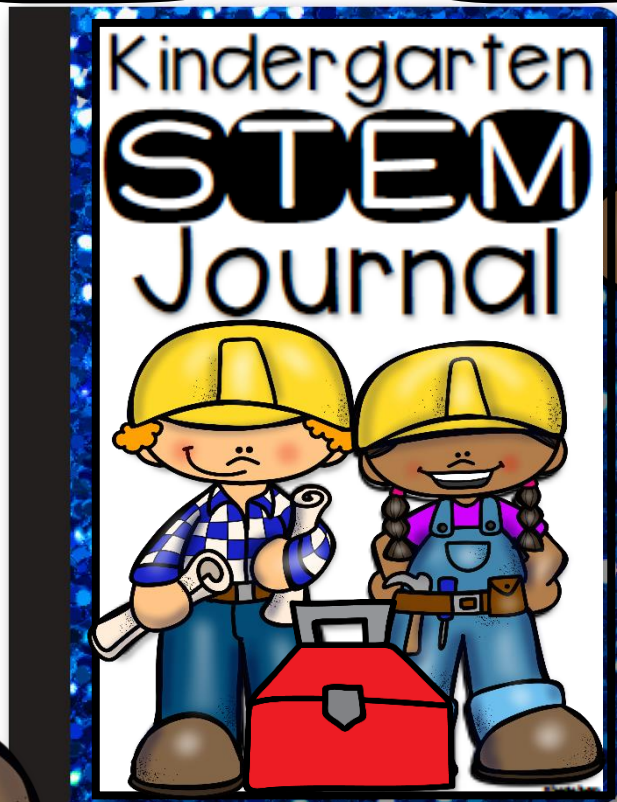


Kindergarten STEM



by Brooke Brown



HOW TO USE

The following materials are designed specifically for Kindergarten students and align with crosscutting NGSS science, engineering and math standards. Six challenges are provided for a variety of science content areas. Student booklets can be cut and glued into composition notebooks (main cover provided on Page 4) or can be used as stand alone booklets by copying front to back and folding in half.

Response boxes are flexible so that students can draw pictures, write words, or write sentences depending on their abilities. Suggested materials for each challenge are inexpensive and/or found in most early childhood classrooms.

Parents can also be asked to donate needed supplies. Students are encouraged to work in partners or small groups. Each challenge should be allotted 45-60 minutes from start to finish, including a whole class discussion both before and after the challenge.

Each challenge in this package contains the following items:

- *Challenge Description, Aligned NGSS Standards, Suggested Materials, and Detailed Lesson Plans
- *Photos of possible student products
- *Teacher Chart to guide whole class discussion for use on a document camera or interactive whiteboard
- *Student booklet to record prior knowledge, questions, materials, blueprints, and reflections (Students can draw or write responses.)

CONTENTS

Page 4: Student Journal Cover

Motion and Stability: Forces and Interactions

Pages 5-9: Racecar Ramp

Pages 10-14: Pompom Catapult

Energy

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Earth's Systems

Pages 20-28: Season Suitcase

Earth and Human Activity

Pages 29-33: Home Sweet Home

Pages 34-38: Trash to Treasure

Page 39: Credits



Kindergarten Kindergarten

STEM STEM

Journal Journal



Racecar Ramp

NGSS Standard Alignment: K-PS2-1: Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object, K-PS2-2: Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or pull, K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool, K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem, CCSS.MATH.CONTENT.K.MD.A.1: Describe and compare measurable attributes.

Challenge Description: Students will create a simple ramp out of cardstock, unifix/linking cubes, and scotch tape. They may use one or both materials to create the height and "track," experimenting with different heights and lengths. They will test their ramps with toy racecars, measuring the distance that the racecar travels with unifix/linking cubes.

Suggested Materials: informational books about pushes and pulls, cardstock, unifix or linking cubes, scotch tape, toy racecars

LESSON PLAN

1. Prime students' background knowledge about force and motion by reading aloud an informational book of your choice. You may also choose to project a variety Google images of ramps on an interactive whiteboard and discuss the similarities and differences.
2. Hold a class discussion, allowing students to share what they already know about pushes and pulls and what they might like to learn. Record their ideas on the provided teacher chart. Have them write the words "push" and "pull" on the front page.
3. Introduce permitted materials and share the challenge. Allow students to share ideas for how the materials work and might fit together in different ways to make a ramp. Ask them how pushes and pulls might be useful. Model how to use unifix cubes as nonstandard units of measurement to measure how far their racecar travels.
4. Allow students at least 45 minutes with partners or small groups to create and test a variety of designs, as well as record in their STEM journals. Encourage them to improve their designs after each test to try to make their racecar go farther.
5. Hold a whole class closing discussion and reflection, allowing students to share what they created and what they learned about pushes and pulls. Record their ideas on the provided teacher chart and guide students as they complete their individual booklets.

RACECAR RAMP

Possible Product



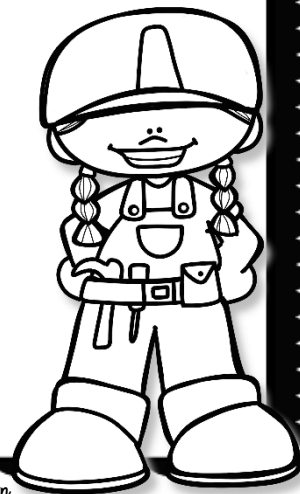
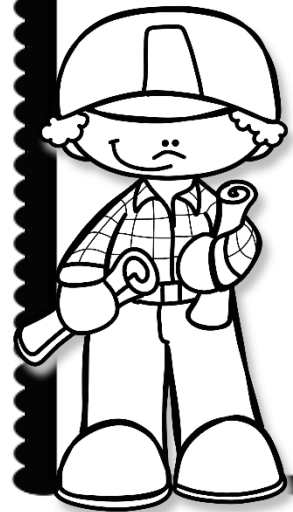
Racecar Ramp

Things that PUSH

Things that PULL

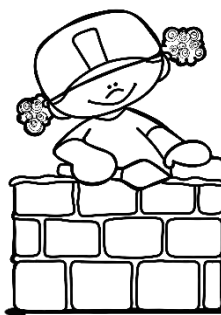
QUESTIONS We Have

What We LEARNED

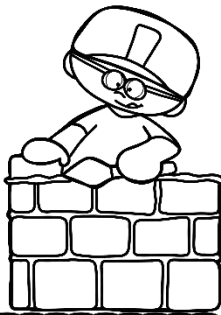


Tests

Test	Number of Cubes
1	
2	
3	
4	
5	



Racecar Ramp



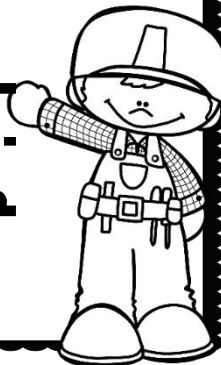
Name: _____

THE CHALLENGE

Can you create a ramp that will make a racecar go the farthest distance?

We can move things with a

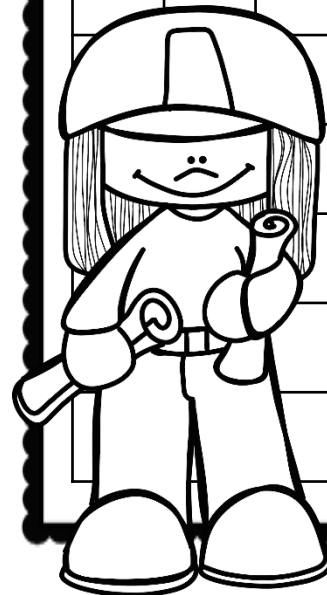
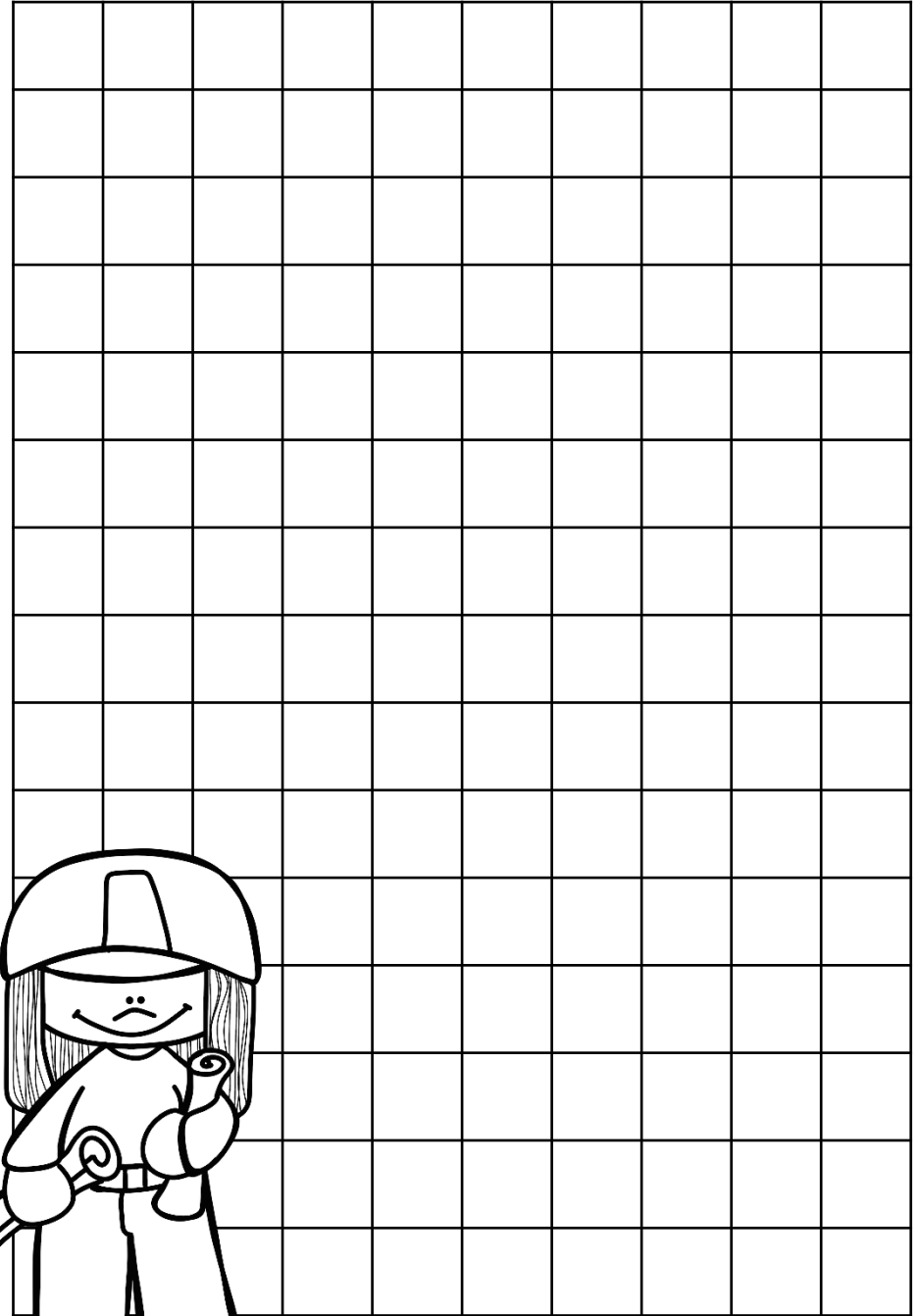
or a



Things that PUSH

Things that PULL

My Ramp



POMPOM Catapult

NGSS Standard Alignment: K-PS2-1: Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object, K-PS2-2: Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or pull, K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool, K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Challenge Description: Students will create a simple model of a catapult using rubber bands, popsicle sticks, and a plastic spoon. While this is a more challenging activity, a wide variety of working catapults are possible. Encourage students to cross sticks in different directions and use the spoon as the "arm" to throw the pompom ball. Students will measure the approximate distances for each launch using a meter stick.

Suggested Materials: informational books about pushes and pulls, popsicle sticks, rubber bands, plastic spoons, pompom balls, meter sticks

LESSON PLAN

1. Prime students' background knowledge about force and motion by reading aloud an informational book of your choice. I would highly suggest that you project a variety Google images of catapults on an interactive whiteboard and discuss the similarities, differences, and parts of a catapult that might be important.
2. Hold a class discussion, allowing students to share what they already know about methods of pushes and pulls and what questions they have. Record their ideas on the provided teacher chart and have them add ideas to their individual booklets.
3. Introduce permitted materials and share the challenge. Allow students to share ideas for how the materials work and might fit together in different ways to make working catapults. Model how to measure longer distances using meter sticks.
4. Allow students at least 45 minutes with partners or small groups to create and test a variety of designs, measure the distance of launches, and record in their STEM journals.
5. Hold a whole class closing discussion and reflection, allowing students to share what they created and what they learned about pushes and pulls. Record their ideas on the provided teacher chart and have them finish their individual booklets.

POM POM Catapult Possible Product

POM POM CATAPULT

.....



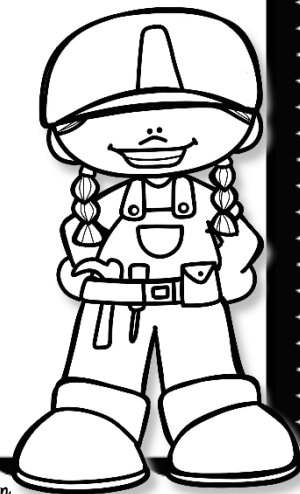
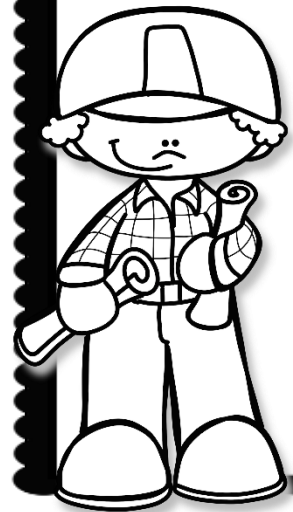
Pompom Catapult

How We PUSH

How We PULL

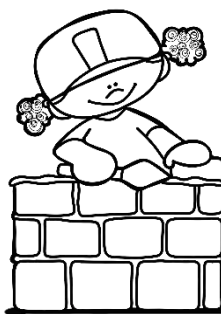
QUESTIONS We Have

What We LEARNED

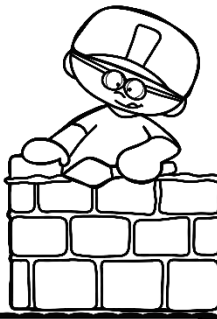


Tests

Test	Meters
1	
2	
3	
4	
5	



Pompom Catapult

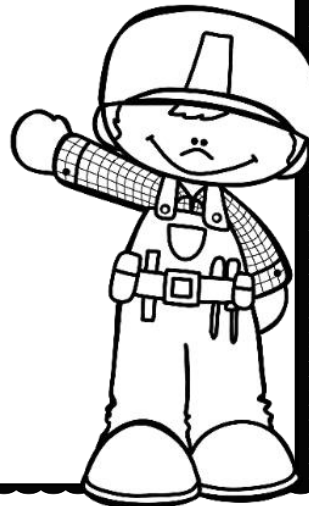


Name: _____

THE CHALLENGE

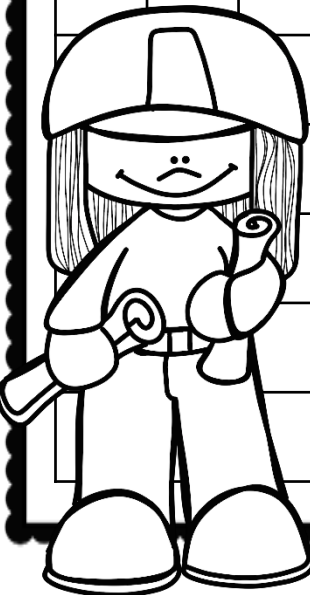
Can you create a catapult that will launch a pompom the farthest distance?

Things on the Playground that PUSH or PULL



How I Push

How I PULL

[illegible]

Shady Spot

NGSS Standard Alignment: K-PS3-1: Make observations to determine the effect of sunlight on Earth's surface, K-PS3-2: Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area. K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool, K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Challenge Description: Students will design a simple model of a tent that provides a shaded area. They can use a paper plate for the base, construction paper for the tent, and unifix/linking cubes to prop up the tent. After the tents are constructed, they will take them outside to test. They will place one ice cube under their shaded tent and another ice cube in direct sunlight to observe the differences.

Suggested Materials: informational books about sunlight, paper plates, construction paper, unifix/linking cubes, ice cubes

LESSON PLAN

1. Prime students' background knowledge about sunlight by reading aloud an informational book of your choice.
2. Hold a class discussion about the difference between the shade and the sunlight. Have them write the words "cool" and "warm"/"hot" on the first page of their booklets. Brainstorm a list of ways that the sun is helpful and ways that it is harmful. Ask students to share what they already know about sunlight and what questions they have. Record their ideas on the provided teacher chart and have them add ideas to their individual booklets.
3. Introduce permitted materials and share the challenge. Allow students to share ideas for how the materials work and might fit together in different ways to create a shaded tent.
4. Allow students at least 30 minutes with partners or small groups to create and test a variety of designs, then bring them outside to test ice cubes under their tents and in direct sunlight. Allow them time to record observations in their STEM journals.
5. Hold a whole class closing discussion and reflection, allowing students to share what they created and what they learned about sunlight. Record their ideas on the provided teacher chart and have them finish their individual booklets.

shady spot+ Possible Product



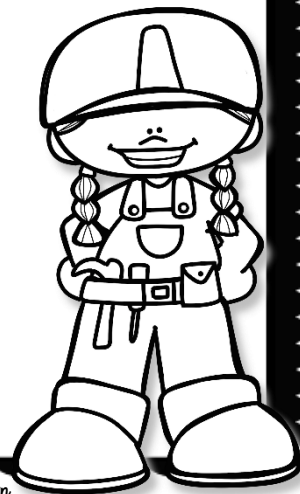
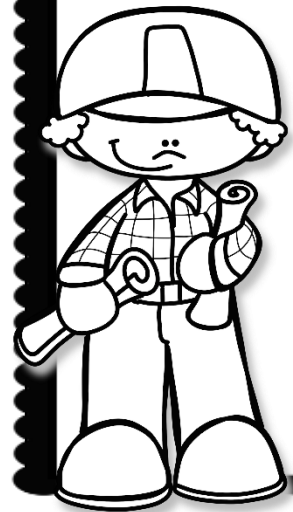
Shady Spot

How the Sun is Helpful

How the Sun is Harmful

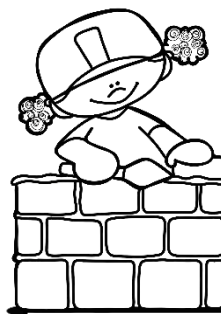
In the Shade...

In the Sunlight...

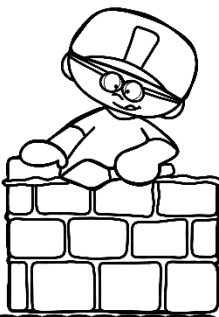


My Ice Cube in the SHADE

My Ice Cube in the SUNLIGHT



Shady Spot



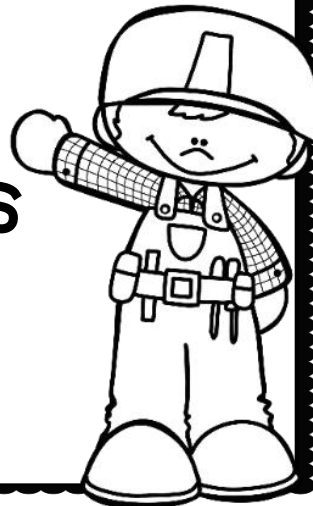
Name: _____

THE CHALLENGE

Can you create a tent
that gives shade?

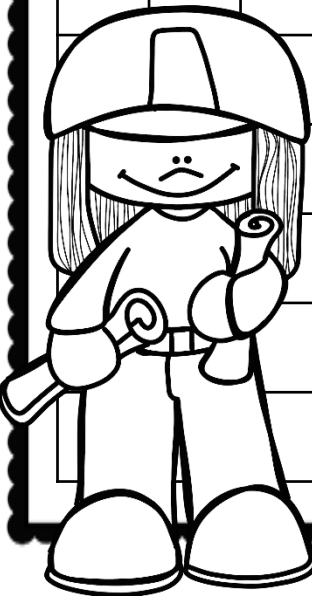
The shade feels

The sunlight feels



How the Sun Helps

How the Sun Harms

[illegible]

Season Suitcase

NGSS Standard Alignment: K-ESS2-1: Use and share observations of local weather conditions to describe patterns over time. K-ESS3-1: Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather. K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool, K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Challenge Description: Students will work with a partner or small group to design and pack a "suitcase" for the season of their choice. They will use a variety of material scraps and construction paper to design small objects that prepare them for that season (including severe weather that might be in that season), then glue the objects onto their paper suitcase. Examples of objects for winter might be a coat, hat, gloves, shelter, snow shovel, heater, and fireplace. Examples of items for spring might be a raincoat, rain boots, umbrella, gardening tools, or tornado shelter items. Students can also draw and color items inside the suitcase.

Suggested Materials: informational books about seasons and weather, copies of season suitcases on pages 25-28, crayons or markers construction paper scraps, fabric scraps, pom pom balls, pipe cleaners, toothpicks, straws, liquid glue or scotch tape

LESSON PLAN

1. Prime students' background knowledge about seasons and weather by reading aloud an informational book of your choice. You may also choose to project a variety Google images of seasons or types of severe weather on an interactive whiteboard so that students can discuss the similarities and differences between each one.
2. Hold a class discussion, allowing students to share what they already know about seasons and what severe weather might be possible in each season. Brainstorm ways that we can prepare for each season. Record their ideas on the provided teacher chart and have them add ideas to their individual booklets.
3. Introduce permitted materials and share the challenge. Allow students to share ideas for what items they might create and "pack" in a suitcase for each season.
4. Allow students at least 45 minutes with partners or small groups to create and add a variety of objects to their suitcases, and well as record in their STEM journals.
5. Hold a whole class closing discussion and reflection, allowing students to share what they created and what they learned about seasons and severe weather. Record their ideas on the provided teacher chart and have them finish their individual booklets.

season suitcase

Possible Product



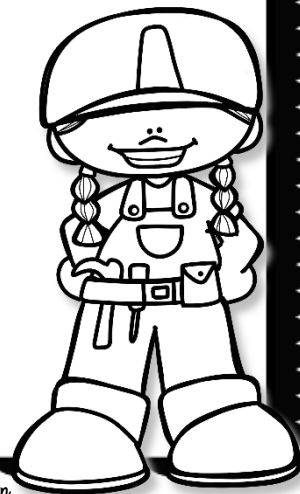
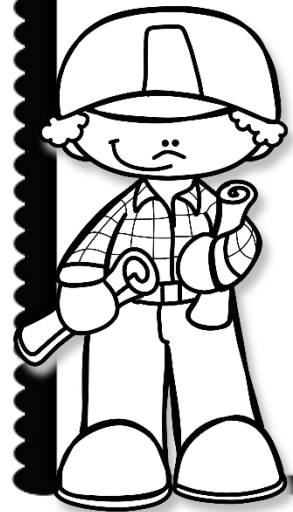
Season Suitcase

Winter

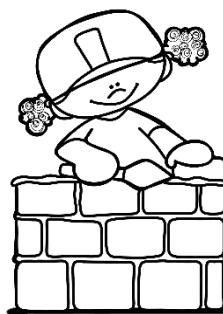
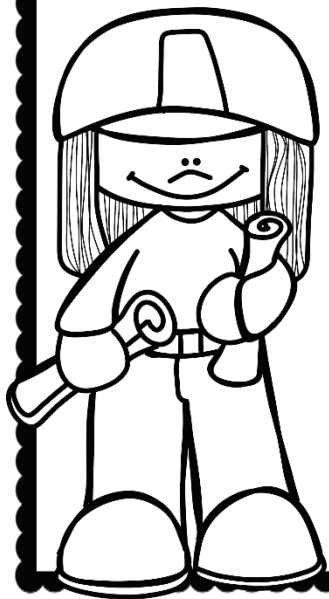
Spring

Summer

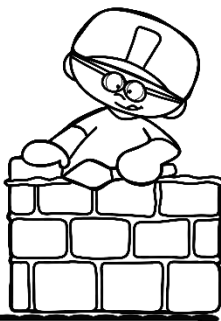
Fall



Types of Severe Weather



Season Suitcase



Name: _____

THE CHALLENGE

Can you pack a suitcase with important things that you need for a season?

Right now, the season is

.....

My favorite
season is

.....



WINTER

SPRING

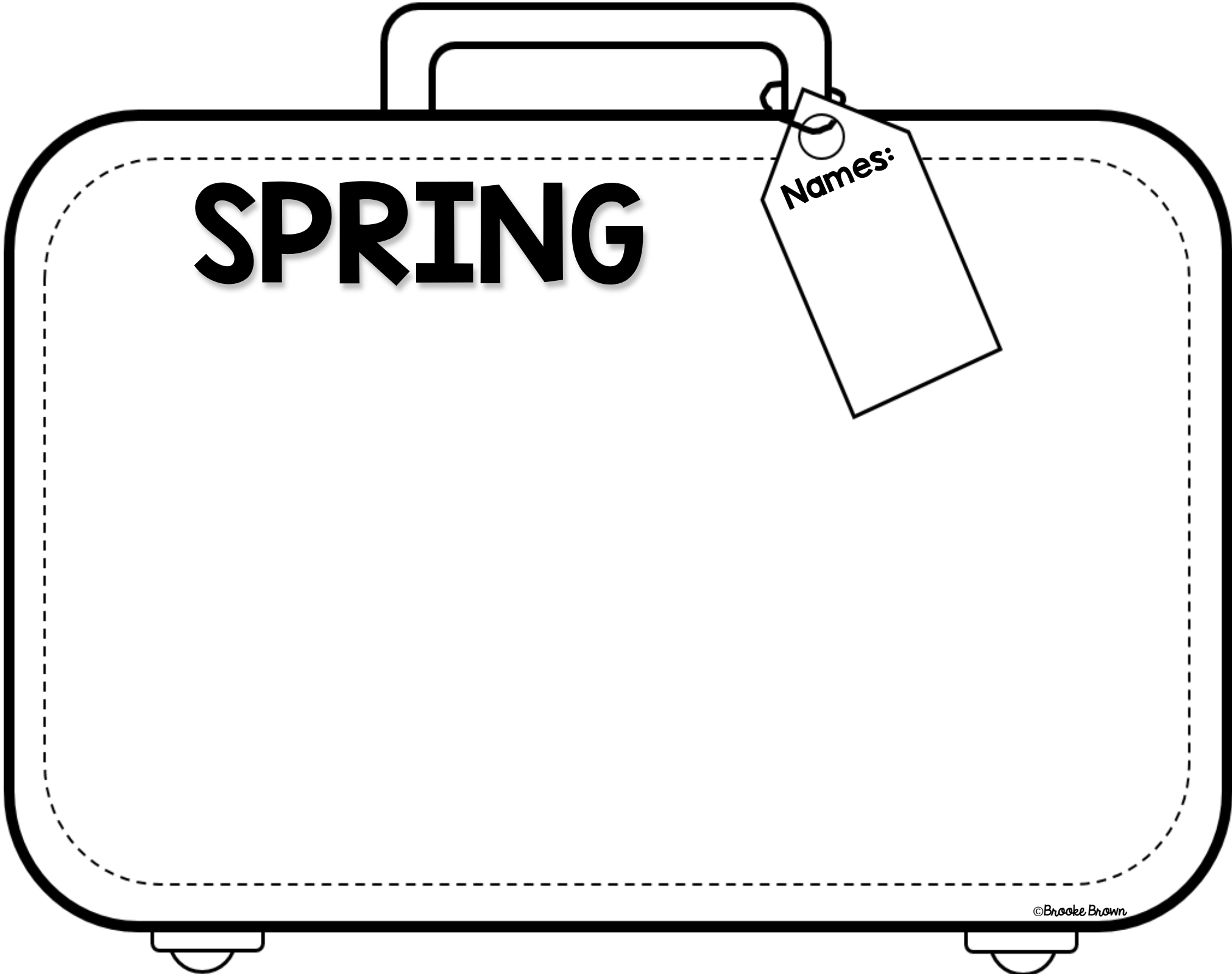
SUMMER

FALL

A black and white line drawing of a suitcase. The suitcase has a thick black outline and a dashed line inside representing the lid. A handle is at the top, and a tag is attached to the right side. The word "WINTER" is written in large, bold, black letters on the left side of the suitcase. The tag is rectangular and tilted, with the word "Names:" written on it.

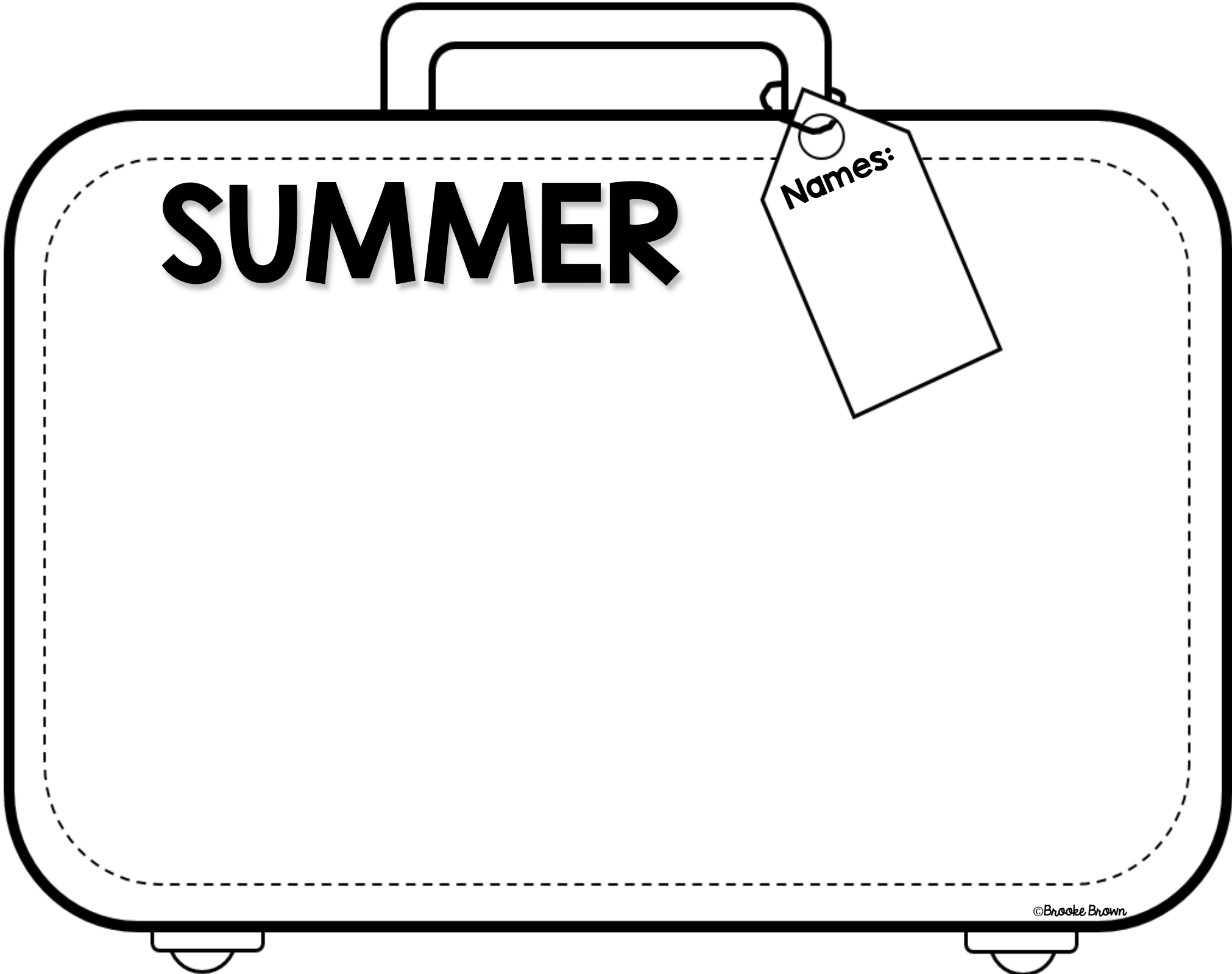
WINTER

Names:

A black and white line drawing of a suitcase. It has a handle on top and a tag hanging from the handle. The tag has the word "Names:" written on it. The word "SPRING" is written in large, bold, black letters on the front of the suitcase. The suitcase has a dashed line border on its front panel.

SPRING

Names:

A black and white line drawing of a suitcase. The suitcase has a thick black outline and a dashed line inside, suggesting a pocket or a decorative border. A handle is attached to the top, and a tag is hanging from the right side. The word "SUMMER" is written in large, bold, black letters across the top of the suitcase. The tag has the word "Names:" written on it.

SUMMER

Names:

A black and white line drawing of a suitcase. The suitcase has a thick black outline and a dashed line inside representing the lid. A handle is at the top, and a tag is attached to the right side. The word "FALL" is written in large, bold, black letters on the left side of the suitcase. The tag is rectangular and tilted, with the word "Names:" written on it. The suitcase has two small feet at the bottom.

FALL

Names:

HOME Sweet HOME

NGSS Standard Alignment: K-ESS3-1: Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live. K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool, K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Challenge Description: Students will choose from a variety of building materials to design and build an animal home for an animal of their choice. Examples of homes are a cave for a bear, nest for a bird, home for a human, doghouse for a dog, pond for a turtle, ocean for a fish, tree for a squirrel, or burrow for a bunny. If time permits, they may construct more than one animal home.

Suggested Materials: informational books about animal homes and habitats, variety of building materials such as Legos, base ten blocks, unifix/linking cubes, and pattern blocks

LESSON PLAN

1. Prime students' background knowledge about animal homes by reading aloud an informational book of your choice.
2. Hold a class discussion, allowing students to share what they already know about animal homes and what questions they still have. Ask students to share what they think animals need to survive and brainstorm different types of animal homes. Also, discuss how specific animal homes are related to meeting animals' needs. Record their ideas on the provided teacher chart and have them add ideas to their individual booklets.
3. Introduce permitted materials and share the challenge instructions. Allow students time to build a variety of animal homes with partners or small groups and record in their STEM journals.
4. Hold a whole class closing discussion and reflection, allowing students to share what they created and what they learned about animal homes. Record their ideas on the provided teacher chart and have them finish their individual booklets.

HOME sweet HOME

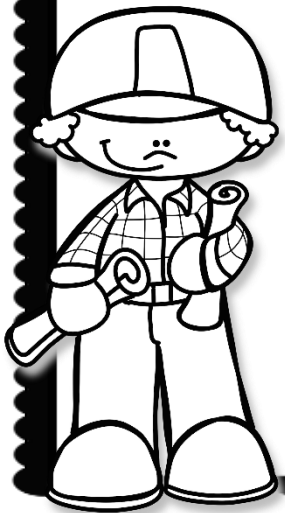
Possible Products



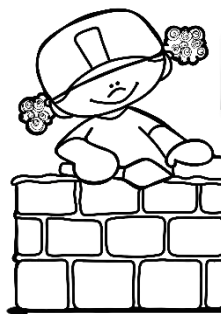
Home Sweet Home

What Animals Need

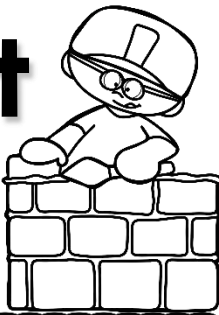
**Types of
Animal Homes**



Types of Animal Homes



Home Sweet Home

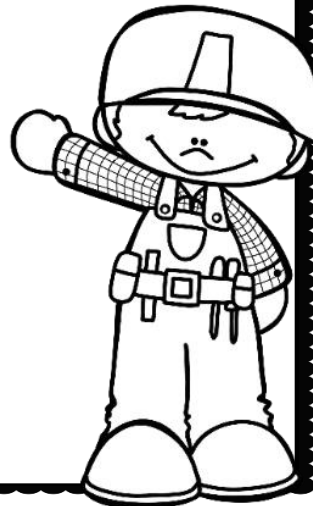


Name: _____

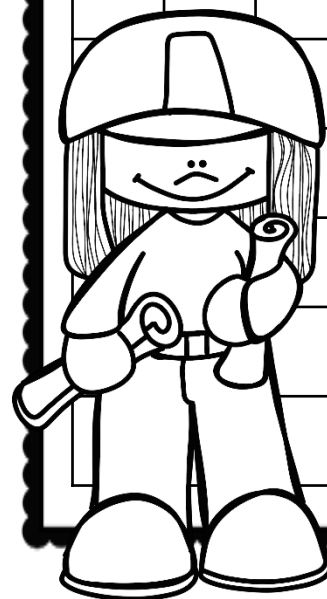
THE CHALLENGE

Can you create a home for an animal?

What Animals Need



2



3

TRash +O TREASURE

NGSS Standard Alignment: K-ESS3-3: Communicate solutions that will reduce the impact of humans on the land, water, air and/or living things in the local environment. K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool, K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Challenge Description: Students will create something useful out of trash, such as a tool, toy, game, or musical instrument. You may choose to have acceptable "trash" items already on hand or have students bring in 3-5 items of their choice that they can make into something new.

Suggested Materials: informational books about recycling and protecting the Earth, trash items such as empty boxes, toilet paper rolls, paper goods, rubber bands, popsicle sticks, construction paper scraps. liquid glue or scotch tape.

LESSON PLAN

1. Prime students' background knowledge about the recycling and protecting the Earth by reading aloud an informational book of your choice.
2. Hold a class discussion, allowing students to share what they already know about protecting the Earth and how trash can harm our Earth. Have them write the word "recycle" on the first page of their booklets. Record their ideas on the provided teacher chart and have them add ideas to their individual booklets.
3. Introduce permitted materials and share the challenge instructions. Brainstorm ways that we can use trash to create something useful and fun. Allow students at least 45 minutes to create their "treasures" and record in their STEM journals.
4. Hold a whole class closing discussion and reflection, allowing students to share what they created and learned about recycling and protecting our Earth. Record their ideas on the provided teacher chart and have them finish their individual booklets.

Trash to Treasure

Possible Products



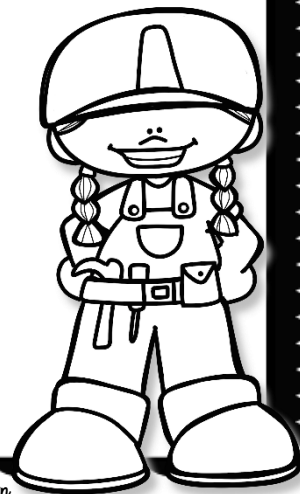
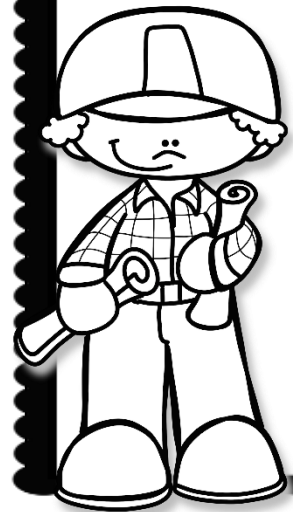
Trash to Treasure

**How Trash Hurts
the Earth**

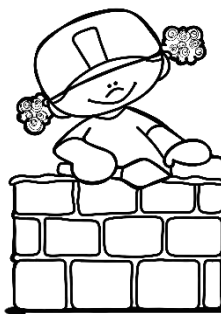
**How I Help the
Earth**

**Things We Can
Recycle**

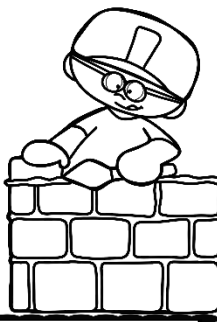
What We Created



How I Can Help the Earth



Trash to Treasure



Name: _____

THE CHALLENGE

Can you create something
useful out of trash?

When we make
trash into
something new, we

2

©Brooke Brown

credits

Thank you for your
purchase!

Created by Brooke Brown

