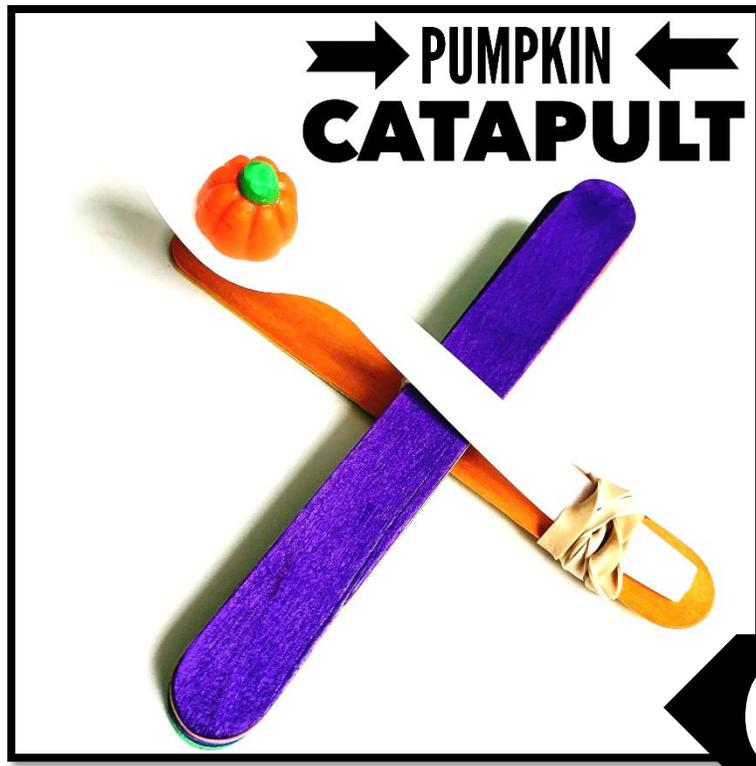


Halloween

STEM



pumpkin catapult challenge

← CREATED BY BROOKE BROWN

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How to Use

The following STEM/STEAM challenge is designed to be completed with partners. You might choose to do activities on separate days. The Pumpkin Catapult challenge will take about 60 minutes, and the Pumpkin Catapult Game stations will take an additional 60 minutes. 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

QR CODE WEBSITES & VIDEOS

TEACHER ANCHOR CHART

STEM CHALLENGE: pumpkin catapult



OVERVIEW: Basic catapult designs are shown in the videos and real world example photos, although students will surprise you with their creative designs during the challenge. Through their construction and tests, students will discover that their catapult needs a base, a lever to launch or throw the pumpkin, and a method of lifting up the lever (usually by winding a stack of disks in an interesting design). A basic design may need to be modified and discussed with younger students before they attempt to make their own. I would suggest taping off a "starting line" for students to launch pumpkins so that measurements are consistent.

KEY SKILLS: Simple Machines (Levers), Forces and Pkts., Potential and Kinetic Energy, Balanced and Unbalanced Forces, Engineering/Design

SUGGESTED READ ALONGS: *The Tallest Shadow Incident* by Ben and Juli Barnett, *Big Pumpkin* by Eric Silverman, *Forces That Make Things Move* by Kimberly Stodley, *Scenes, Seasons, and Rate: A Book About Levers* by Richard Datt

MATERIALS PER GROUP: 1 mini pumpkin (solid or decorative), 2 plastic spoons, 2 rubber bands, 2 jumbo popsicle sticks, 3 ft. of masking tape, 1 tape measure or yardstick.

LESSON PLAN

1. Activate students' prior knowledge by asking them to share what they already know about catapults, what they're used for, and what important parts they might have.
2. Share and discuss the videos/Anchors on "Pumpkin Catapults."
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 and discuss key vocabulary cards related to the challenge.
5. Introduce the STEM challenge and permitted materials.
6. Have students sketch blueprints of their designs on their recording sheets.
7. Distribute materials and allow students 15-40 minutes, with partners or small groups, to construct their catapults. Test their effectiveness, and measure the distances that their pumpkin travels.
8. Hold a whole class closing discussion and reflection, allowing students to share their catapult designs. Use the "I'm a Perfect" poster to guide the discussion.
9. If time permits, allow students to rotate through the "Pumpkin Catapult Games" stations with their catapults.

pumpkin catapult

You need to send a pumpkin over the fence to your neighbor.

Construct a catapult that will launch your pumpkin the farthest distance.



MATERIALS:

- Jumbo popsicle sticks (2 per group)
- Rubber bands (8 per group)
- Masking tape (3 ft. per group)
- Plastic spoons (1-2 per group)
- Mini pumpkins
- Tape measure or yardstick

EXPLORE CATAPULTS

TYPES OF CATAPULTS




LEVERS




PUMPKIN CHUNKIN'




POTENTIAL AND KINETIC ENERGY



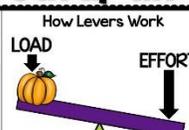

pumpkin catapult

REAL WORLD EXAMPLES



What is similar? What is different?

How Levers Work



Examples of Stored (Potential) Energy

Examples of Working (Kinetic) Energy

KEY VOCABULARY

K-2nd RECORDING SHEET

3rd-5th RECORDING SHEET

REFLECTION DISCUSSION QUESTIONS

WORDS TO KNOW

launch



to start or set in motion

lever



a bar that rests on a fulcrum that is used to move a load with one end when effort is applied to the other end

effort



energy that is used to move or lift an object or load

load



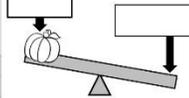
an object that needs to be moved or lifted by force

pumpkin catapult name: _____

MY BLUEPRINT

Draw a picture of your catapult. Label the LEVER.

Label the EFFORT and LOAD on this lever.



How far did your pumpkin travel?

TEST 1	
TEST 2	
TEST 3	

pumpkin catapult name: _____

Draw a blueprint of your catapult and label the LEVER.

Label the EFFORT and LOAD.



How do levers make work easier?

What is an example of an object with a lever?

How is potential (stored) energy used in your catapult?

How is kinetic (working) energy used in your catapult?

How far did your pumpkin travel?

TEST 1	
TEST 2	
TEST 3	

LET'S REFLECT!

- What was most difficult about this challenge?
- Which one of your launches was the farthest and why do you think so?
- Why is a lever an important feature of a catapult?
- How can levers make work easier?
- How is potential (stored) energy and kinetic (working) energy used in a catapult?
- How are balanced forces (no motion) and unbalanced forces (motion) used in a catapult?
- What are some different ways catapults can be useful?
- If we completed this challenge again, what would you do differently next time?

Optional Google Slides Notebook

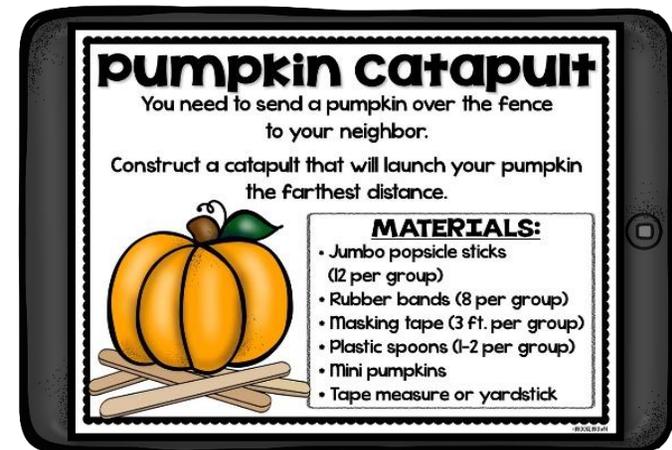
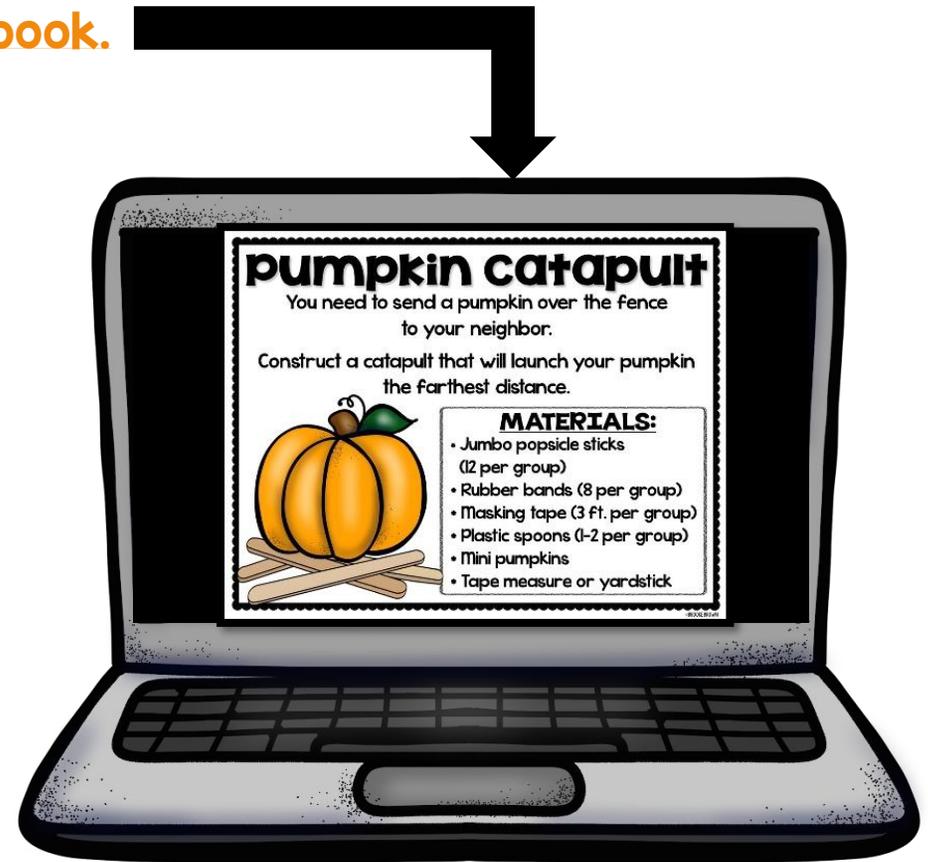
1. Download [Link for the Google Slides Notebook](#).
2. Sign into your Google Account.
3. **MAKE A COPY** of the notebook.

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**



**TEST &
IMPROVE**



PLAN



CREATE



SUPPLIES CHECKLIST

CHALLENGE	ITEM	NUMBER PER GROUP	I HAVE IT
Pumpkin Catapult	mini pumpkins (small candy or decorative)	1	
	plastic spoons	2	
	rubber bands	8	
	masking tape	3 feet	
	jumbo popsicle sticks	12	
	tape measures or yardsticks	1	

STANDARDS ALIGNMENT

CHALLENGE	ENGINEERING	SCIENCE	MATH
Pumpkin Catapult	<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>MP1: 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: pumpkin catapult



OVERVIEW: Basic catapult designs are shown in the video links and real world example photos, although students will surprise you with their creative designs during this challenge! Through their construction and tests, students will discover that their catapult needs a base, a lever to launch or throw the pumpkin, and a method of lifting up the lever (usually by wedging a stack of sticks in an intersecting design). A basic design may need to be modeled and discussed with younger students before they attempt to make their own. I would suggest taping off a “starting line” for students to launch pumpkins so that measurements are consistent.

KEY SKILLS: Simple Machines (Levers), Pushes and Pulls, Potential and Kinetic Energy, Balanced and Unbalanced Forces, Engineering Catapults

SUGGESTED READ ALOUDS: [The Marshmallow Incident by Ron and Judi Barrett](#), [Big Pumpkin by Erica Silverman](#), [Forces Make Things Move by Kimberly Bradley](#), [Scoop, Seesaw, and Raise: A Book About Levers by Michael Dahl](#)

MATERIALS PER GROUP: 1 mini pumpkin (candy or decorative), 2 plastic spoons, 8 rubber bands, 12 jumbo popsicle sticks, 3 ft. of masking tape, 1 tape measure or yardstick

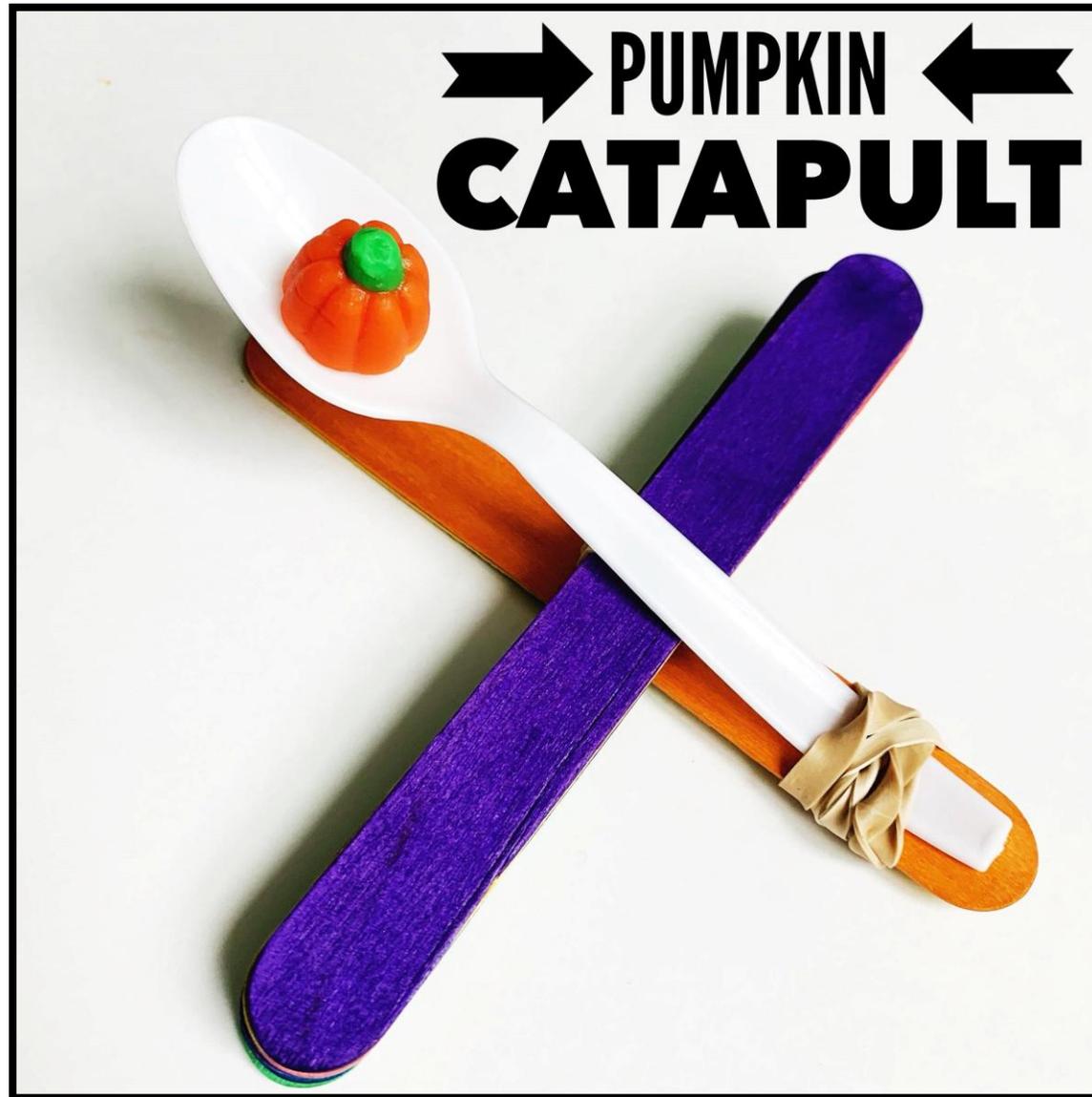
LESSON PLAN

1. Activate students' prior knowledge by asking them to share what they already know about catapults, what they're used for, and what important parts they might have.
2. Share and discuss the videos/websites on “Explore Catapults.”
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 45-60 minutes with partners or small groups to construct their catapults, test their effectiveness, and measure the distances that their pumpkin travels.
8. Hold a whole class closing discussion and reflection, allowing students to share their catapult designs. Use the “Let's Reflect” poster to guide the discussion.
9. If time permits, allow students to rotate through the “Pumpkin Catapult Games” stations with their catapults.

pumpkin catapult

POSSIBLE PRODUCT

(for teacher reference only)



pumpkin catapult

You need to send a pumpkin over the fence
to your neighbor.

Construct a catapult that will launch your pumpkin
the farthest distance.



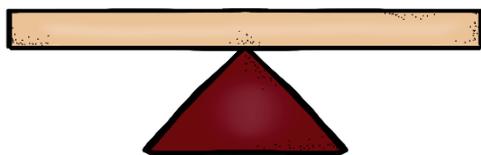
MATERIALS:

- * Jumbo popsicle sticks
(12 per group)
- * Rubber bands (8 per group)
- * Masking tape (3 ft. per group)
- * Plastic spoons (1-2 per group)
- * Mini pumpkins
- * Tape measure or yardstick

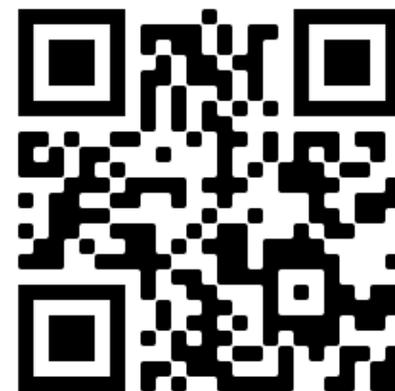
EXPLORE

CATAPULTS

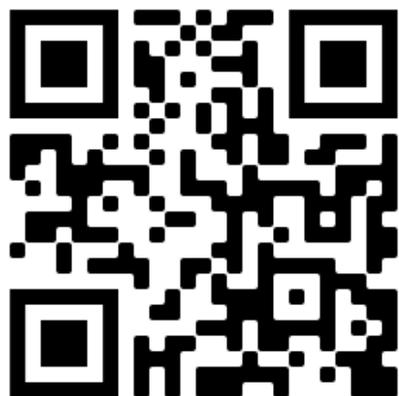
LEVERS



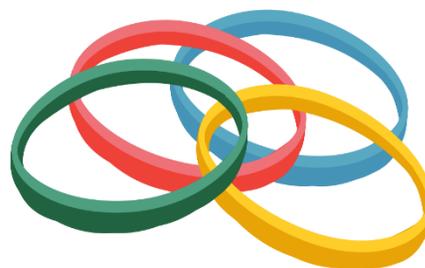
BUILD A CATAPULT



LIFE-SIZE CATAPULTS



POTENTIAL AND KINETIC ENERGY



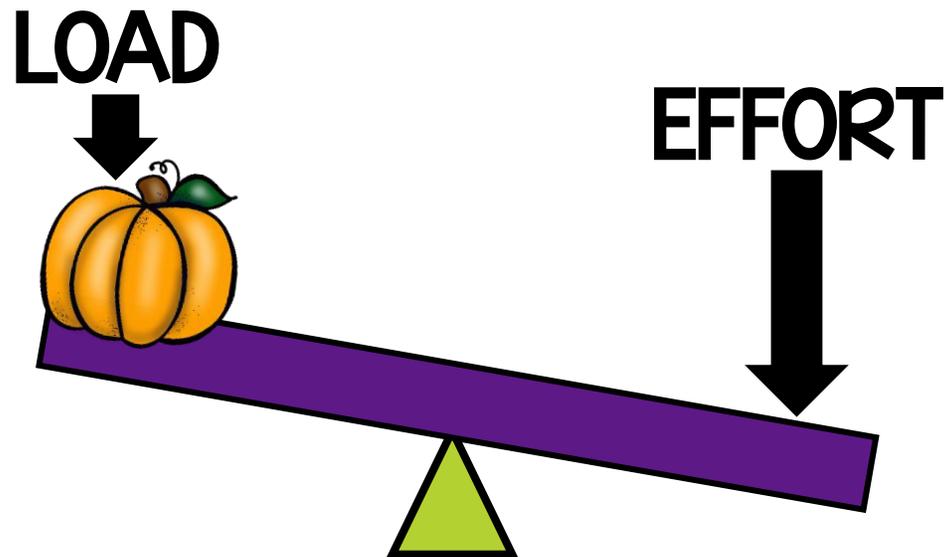
pumpkin catapult

REAL WORLD EXAMPLES



What is similar? What is different?

How Levers Work



Examples of
Stored (Potential) Energy

Examples of
Working (Kinetic) Energy



WORDS TO KNOW



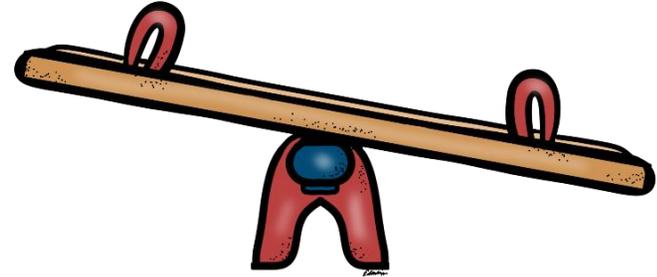
launch



to start
or set in
motion

lever

a bar that rests on a fulcrum that is
used to move a load with one end when
effort is applied to the other end



effort

energy that
is used to
move or lift
an object
or load



load

an object
that needs to
be moved
or lifted by
effort or force



WORDS TO KNOW



balanced force



equal forces
that cause
no change in
motion

unbalanced force



unequal forces
that cause a
change in motion,
such as speed
or direction

potential energy



stored energy
in an object
or system

kinetic energy



working energy
when an object
is in motion

LET'S REFLECT!



- What was most difficult about this challenge?
- Which one of your launches was the farthest and why do you think so?
- Why is a lever an important feature of a catapult?
- How can levers make work easier?
- How is potential (stored) energy and kinetic (working) energy used in a catapult?
- How are balanced forces (no motion) and unbalanced forces (motion) used in a catapult?
- What are some different ways catapults can be useful?
- If we completed this challenge again, what would you do differently next time?

pumpkin catapult

GAMES



pumpkin catapult games

The Pumpkin Catapult Games are designed to follow the Pumpkin Catapult STEM Challenge. These 6 events offer a fun and competitive extension that allows your students to put their working catapults to the test for distance and accuracy. These events also work great for Fall Party day!

The following 6 events need to be set up at 6 different stations in your classroom with instruction cards taped near the station. The "Go the Distance" Event (number 1) is most effective when set up in a hallway to offer more room for measurement.

All 6 events will take about an hour total for your students to complete.

Needed materials are listed on the instruction cards.

Copy the student recording booklet front to back and students will fold in half.

Student groups will take their catapult, candy pumpkin, pencil and recording booklet to each station with them. They will follow the instructions at each station and record test results in their booklets.

Optional award medals are provided for each event if you'd like to give them to top performing groups.

CONTENTS

- * Instruction cards for each event
- * Student recording booklet
- * Award medals





GO THE DISTANCE

MATERIALS

- Pumpkin Catapult
- Pumpkin Candy
- Meterstick or Measuring Tape

CHALLENGE

Use your catapult to launch your pumpkin the farthest distance.
Record your measurements for 3 tests.

©Brooke Brown



HIT THE TARGET

MATERIALS

- Pumpkin Catapult
- Pumpkin Candy
- Pumpkin Target taped to the wall

CHALLENGE

Use your catapult to make your pumpkin hit the target.
Record your scores for 3 tests.

©Brooke Brown



GREAT HEIGHTS

MATERIALS

- Pumpkin Catapult
- Pumpkin Candy
- Stack of 20 books

CHALLENGE

Use your catapult to launch your pumpkin from the floor over the top of the book stack. Record your results for 3 tests.

©Brooke Brown



TOWER TOPPLE

MATERIALS

- Pumpkin Catapult
- Pumpkin Candy
- Stack of 10 cups in a pyramid

CHALLENGE

Use your catapult to launch the pumpkin and knock over as many cups as possible. Record your results for 3 tests.

©Brooke Brown



SCORE A BUCKET

MATERIALS

- Pumpkin Catapult
- Pumpkin Candy
- Large tub or bucket

CHALLENGE

Use your catapult to launch your pumpkin and try to land it inside the bucket. Record your scores for 3 tests.

©Brooke Brown



HOOP SHOOT

MATERIALS

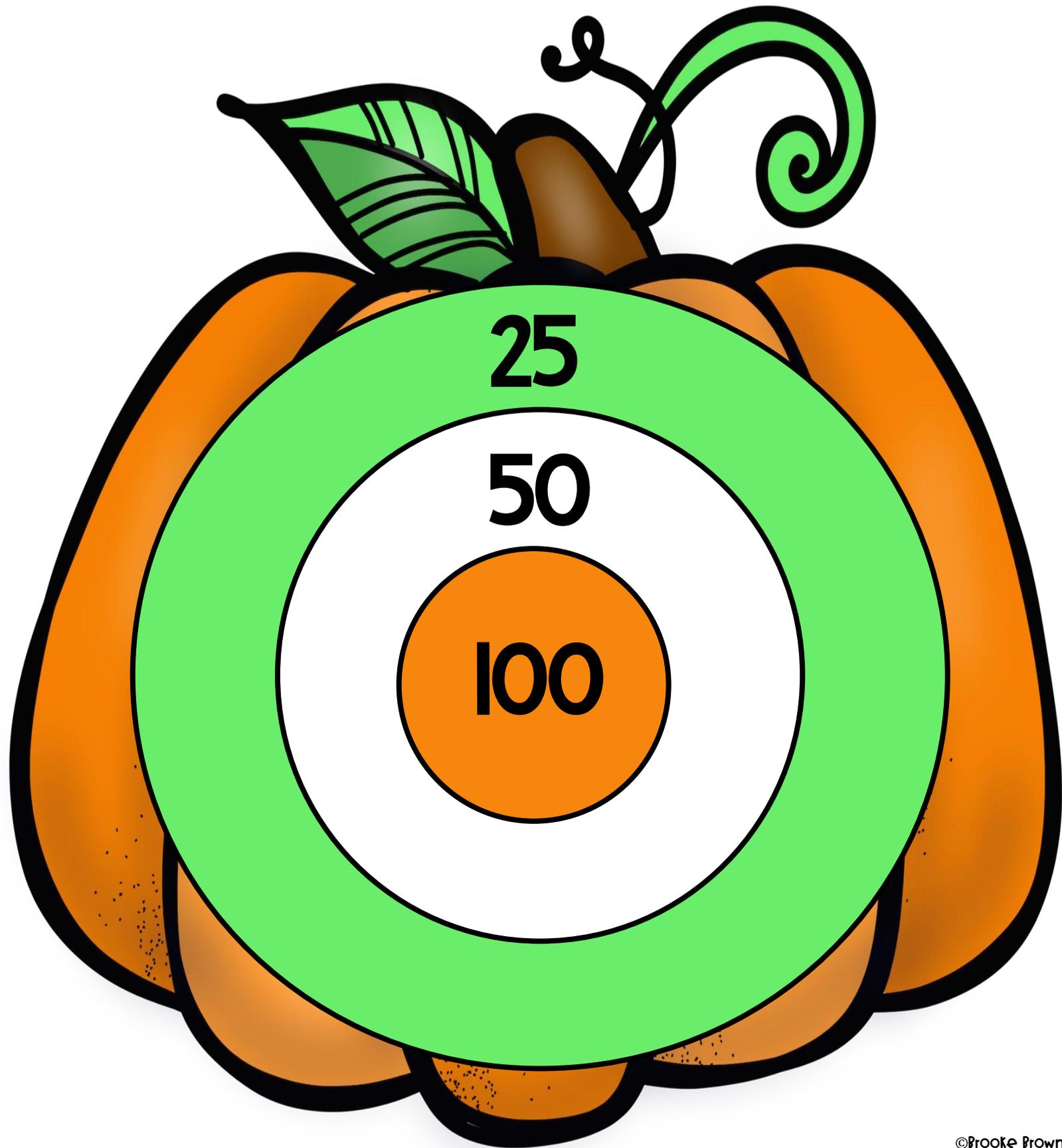
- Pumpkin Catapult
- Pumpkin Candy
- Hula hoop OR pipe cleaners attached in a large hoop shape

CHALLENGE

Have your partner hold up the hoop. Use your catapult to launch the pumpkin through the hoop. Record your scores for 3 tests.

©Brooke Brown

HIT THE TARGET



6 HOOP SHOOT

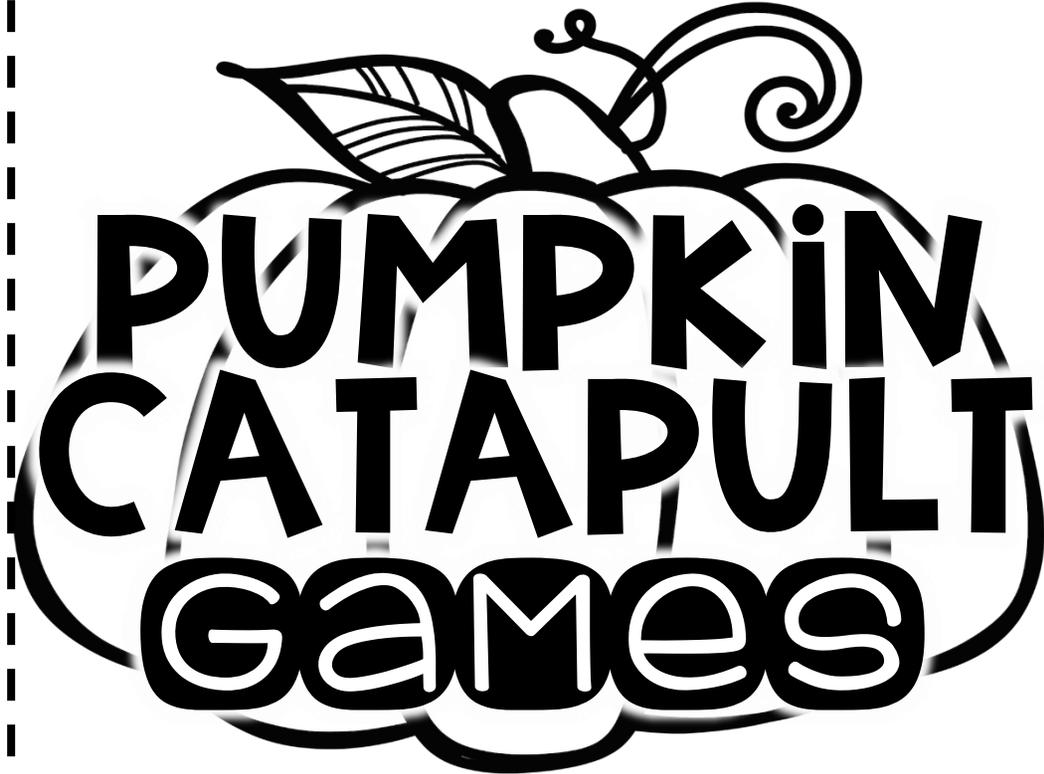
TEST	Did the pumpkin go through the hoop?
1	
2	
3	
How many total launches through the hoop?	

The easiest event was:

It was easy because:

The most challenging event was:

It was challenging because:



Name: _____

1 GO THE DISTANCE

TEST	DISTANCE
1	
2	
3	
Farthest Distance	

2 HIT THE TARGET

TEST	Points Earned
1	
2	
3	
TOTAL POINTS	

4 TOWER TOPPLE

TEST	Cups Knocked Over
1	
2	
3	
TOTAL CUPS KNOCKED OVER	

3 GREAT HEIGHTS

TEST	Did the pumpkin go over the book tower?
1	
2	
3	
How many total launches over the tower?	

5 SCORE A BUCKET

TEST	Did the pumpkin land in the basket?
1	
2	
3	
How many total successful baskets?	

AWARD MEDALS

Copy on colored paper and give to student groups with the best scores for each event. You can also punch holes in the top and use yarn to string onto necklaces.



AWARD MEDALS

Copy on colored paper and give to student groups with the best scores for each event. You can also punch holes in the top and use yarn to string onto necklaces.



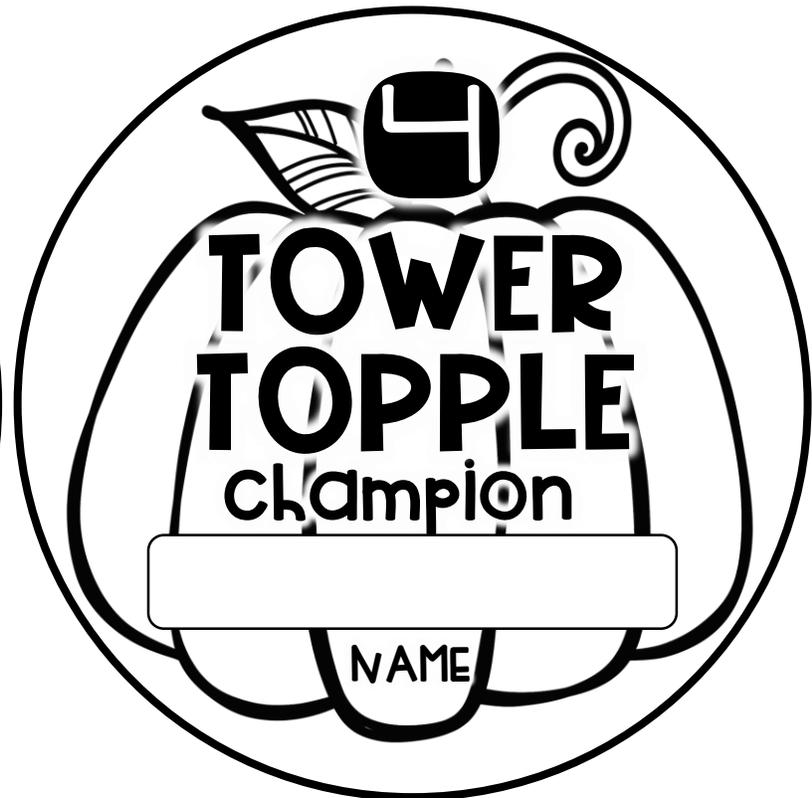
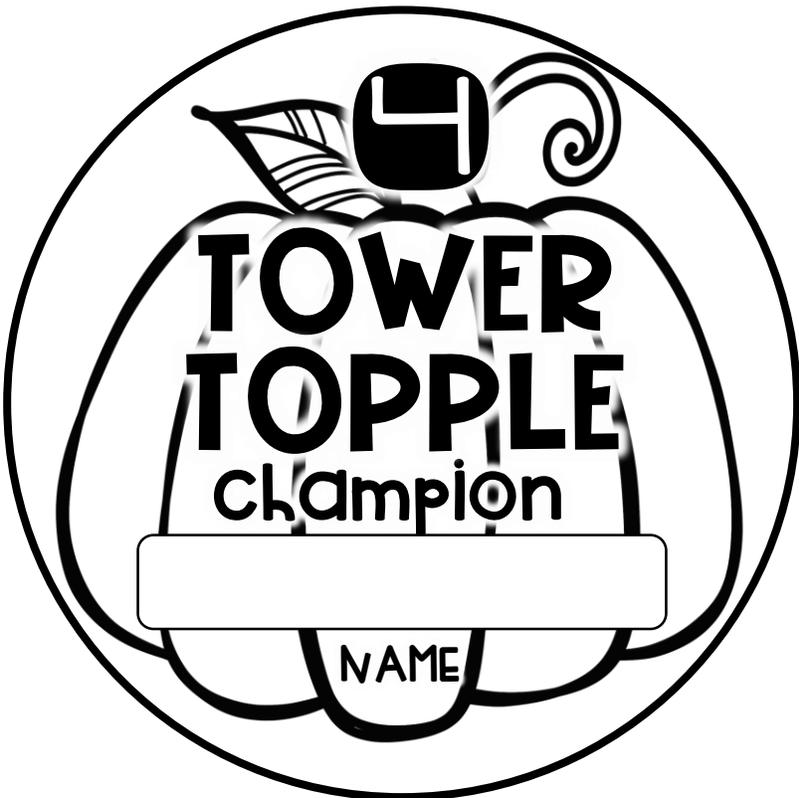
AWARD MEDALS

Copy on colored paper and give to student groups with the best scores for each event. You can also punch holes in the top and use yarn to string onto necklaces.



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AWARD MEDALS

Copy on colored paper and give to student groups with the best scores for each event. You can also punch holes in the top and use yarn to string onto necklaces.



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.
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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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: _____

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.
Student completed assigned blueprint and reflection sheet.	Student partially completed assigned blueprint and reflection sheet.	Student did not complete assigned blueprint and recording sheet.
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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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Student fully participated in class discussions.	Student somewhat participated in class discussions.	Student did not participate in class discussions.

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!



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Child's Name: _____

I am able to donate: _____

credits

created by Brooke Brown

Thank you for your purchase!



Tim Sensei, TpT