

# Cup Stacking

## Challenge

Liz LaRosa [www.middleschoolscience.com](http://www.middleschoolscience.com) 2015

### Objectives

- to work together as a team towards a common goal
- to improve verbal and nonverbal communication skills
- to explore and implement various problem solving techniques

## Materials

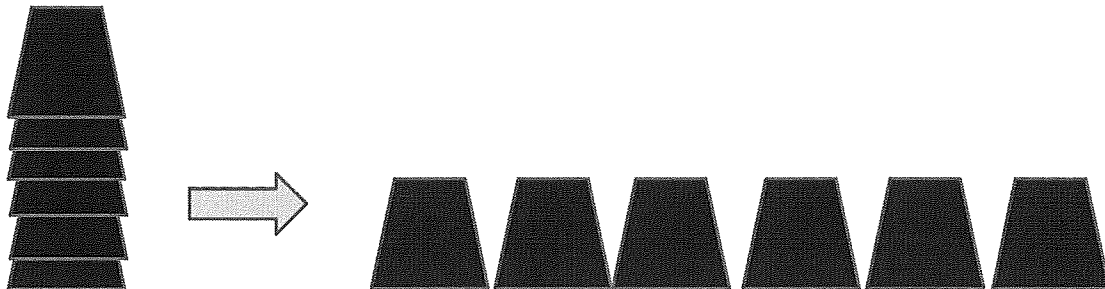
Per group of 3-4 students

- 6 cups
- 1 rubber band
- 4-6 pieces of string of equal length

## Rules

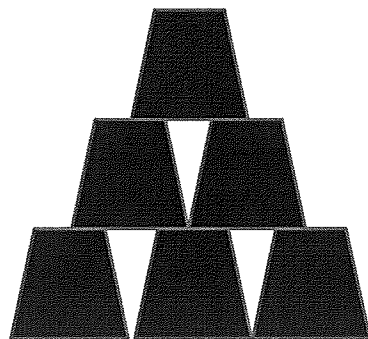
1. All group members must participate for each challenge
2. Only the rubber band can touch or move the cups
3. If the directions for each challenge are not followed correctly, groups will have to re-start that challenge
4. You will have 3 minutes to preview the challenges and make a plan with your group
5. You will then have \_\_\_\_\_ minutes to complete all 6 challenges
6. Have each challenge checked by me before continuing to the next challenge
7. Good luck!

## Challenge # 1



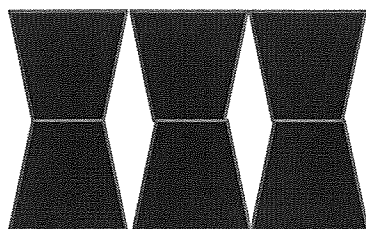
Directions: Each member may use 2 hands to control their string and use verbal communication

## Challenge # 2



Directions: Each member may use 2 hands to control their string and use verbal communication

## Challenge # 3

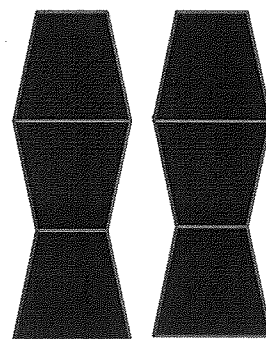


Directions: Each member may use 2 hands to control their string and use verbal communication

## Challenge # 4

Directions:

Each member must use only 1 hand to control their string (the other hand is behind your back), but NO verbal communication is allowed



## Challenge # 5

### Directions:

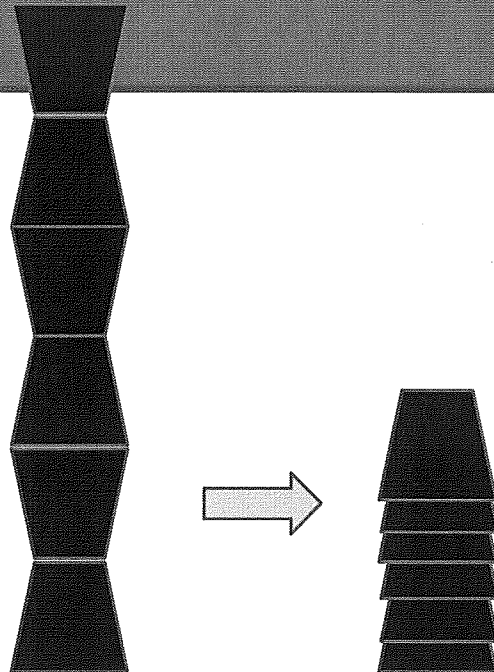
Each member must use only 1 hand to control their string (the other hand is behind your back), but NO verbal communication is allowed

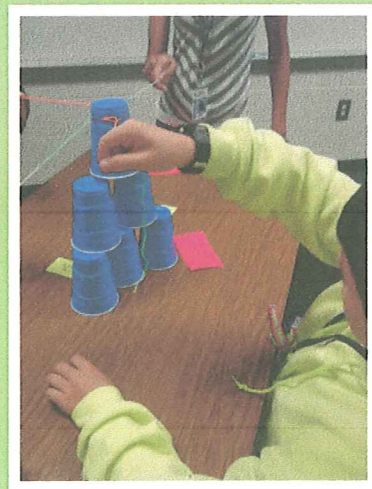
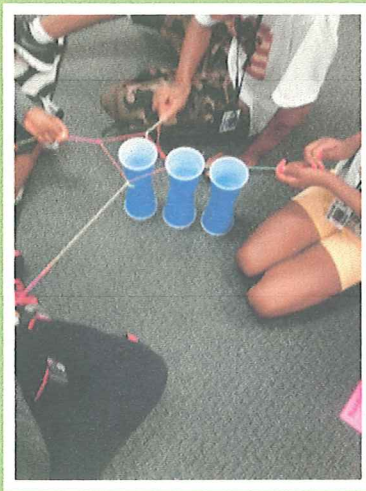
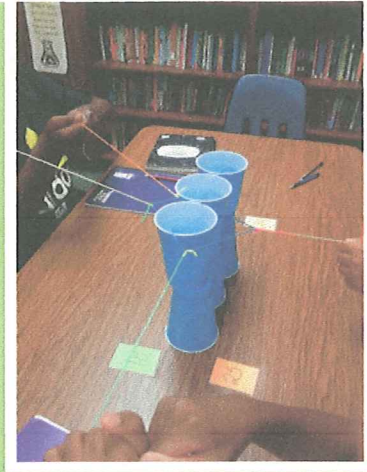


## Challenge # 6

### Directions:

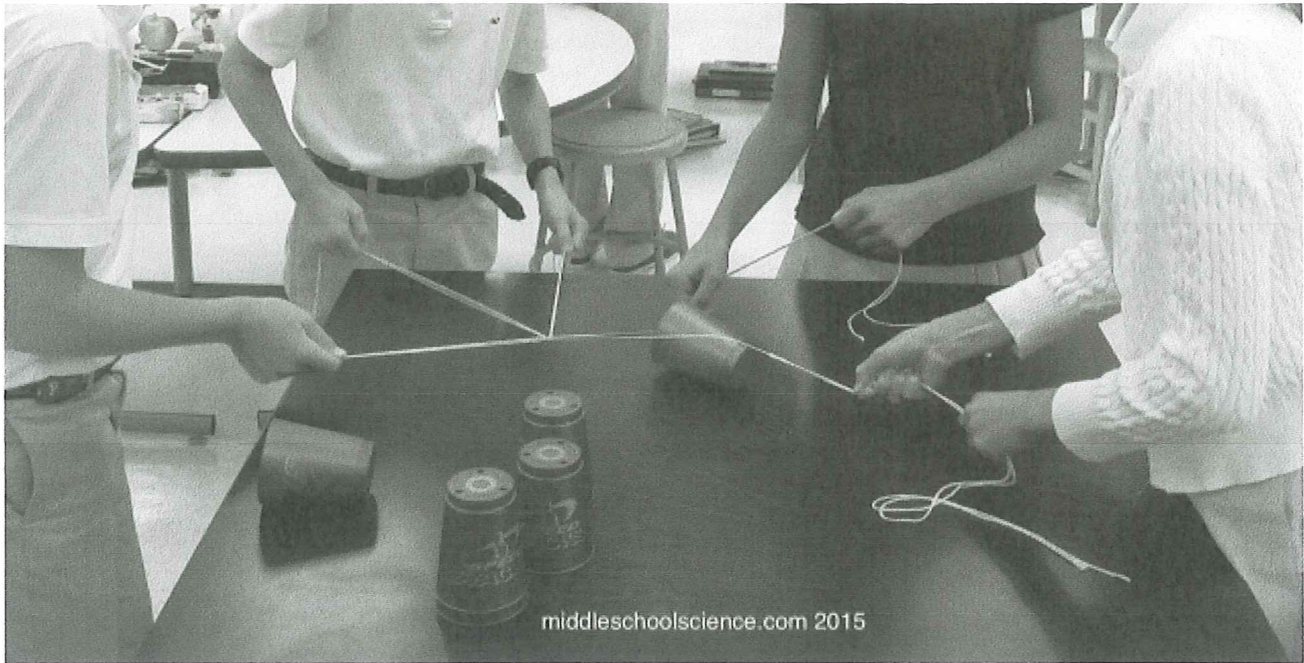
Each member must use only 1 hand to control their string (the other hand is behind your back), but NO verbal communication is allowed





Most of the groups accomplished this task pretty quickly. As the groups finished I added cups to make the challenge more difficult. The next challenge I gave the students was to use the same concept to build a pyramid with four cups on the bottom, then three on the next level, then two, and finally one. If the group finished this task, I had them remove the cups from the pyramid, using only the "tool" and arrange them in the starting position.

As I walked around in one class, I overheard one student ask, "What does this have to do with language arts?" I used this as a "teachable moment" when we discussed the successes and challenges. I lead the students in a discussion about how this didn't tie to our



*Trying to pick up a cup that fell over.*



*Almost done with Challenge #4!*

## Discussion & Reflection

1. Which challenge was the easiest for you group to complete? The most difficult? Why?
2. Did your techniques change as you advanced to each challenge? Explain why or why not.
3. Describe a technique that worked best within your group.
4. Compare using two hands vs. one hand when holding the string to guide the cups. List advantages and disadvantages for each.
5. Compare using verbal and nonverbal communication, what were some of the challenges your group faced?

6. If you were to complete this activity again, what would your group do differently? What would you do the same?
7. Why are collaboration and communication skills important characteristics for scientists to have?
8. Did you feel like giving up at any point? How did you and your group deal with frustration?



Games, Science Skills     active learning, activity, challenge, collaboration, communication, cup, ETS1.A, ETS1.B, nonverbal, perseverance, problem solving, pyramid, SEP3, skills, stacking, stem, team building, verbal

## 18 thoughts on “Cup Stacking Collaboration Challenge”

### 1. APRIL THOMPSON

August 24, 2016 / 12:15 am

I cannot open the task cards. Suggestion?

Reply

**LIZ LAROSA**

August 24, 2016 / 8:37 am

The task cards are a pdf file, you will need Adobe to read the file. ~Liz

Reply

### 2. AMI

August 15, 2016 / 6:09 pm

Does it matter what kind of cups are used?

Reply

**LIZ LAROSA**

August 15, 2016 / 7:14 pm



# BETTERLESSON

Heather Sparks TAFT Middle School, OKLAHOMA CITY, OK  
8th Grade Math : Unit #5 - The Fabulous World of Functions : Lesson #15

## Cup Stacking

**Objective:** *SWBAT gather data and create a function to represent a relationship among the data.*

Standards: 8.F.B.4 8.F.B.5 MP2 MP4 MP6 MP7 MP8

Subject(s): Math

 60 minutes

### 1 Warm Up - 5 minutes

For today's Warm Up, I have again provided students a graph that has no axes labels. This time, however, the slope is negative. I want students to create a story that matches this graph. This may pose a challenge as we have mostly seen and worked with positive slope line previously.

Once the timer sounds, I ask some "pre-selected" volunteers (ones I have picked out and asked beforehand while taking roll) to share their stories. After each story is shared, I ask students to respond with thumbs-up (agree), thumbs-down (disagree) or thumbs-sideways (not sure). My hope is that by practicing these graphing stories, students will continue to gain a stronger conceptual understanding of the meaning embedded in graphs.

#### RESOURCES



Cup Stacking Warm Up.pdf <http://betterlesson.com/lesson/resource/2451514/cup-stacking-warm-up-pdf>

### 2 Box of Cups Challenge - 30 minutes

For today's activity, I provide each student a stack of 6 cups. Because I typically seat four students to a table, I have four different brands of cups that I use. That way, students can still support each other in the activity without giving each other data since each person at the table has a different set of 'prototype' cups.

Once everyone has their cups and lab sheet, I introduce today's scenario:

*You have been hired by a box company to design a box that holds 50 cups. You have only been given a small number of cups as prototypes. You must gather data about the cups you stack and organize it in a table. Then, using your data, graph the information. Use your table, graph, or rule to determine the height of the box you need to design for your stack of cups.*

I explain that accuracy in measurement is critical in today's task, so we will be using Mathematical Practice 4: Attend to precision. I call the students' attention to the fact that the table is already labeled in centimeters and ask, "Is centimeters precise enough or should we measure to tenths of a centimeter (mm)? What do you think the company would like?"

I then explain that I intentionally gave each student a stack of cups that is different from others at their table. However, I still want to encourage them to support each other during the task as needed. I ask for clarifying questions and set the task timer for 30 minutes.

## RESOURCES


 Cup Stacking.notebook <http://betterlesson.com/lesson/resource/2451659/cup-stacking-notebook>

 Cup Stacking Notebook.pdf <http://betterlesson.com/lesson/resource/2451660/cup-stacking-notebook-pdf>

 cup\_stacking task.pdf [http://betterlesson.com/lesson/resource/2451664/cup\\_stacking-task-pdf](http://betterlesson.com/lesson/resource/2451664/cup_stacking-task-pdf)

### THE VALUE OF WRITING: Writing Across the Disciplines

Cup Stacking.MP4

 <http://betterlesson.com/lesson/section/24902/cup-stacking>

## 3 Closure - 10 minutes

When the task timer sounds, I ask for volunteers to share the equations they found for their cup type.

On the SmartBoard, I wrote three equations for each type in a table, so students could easily compare them. I asked students to talk at their table for one minute about what would cause the differences in the equations of the same cup types. After a minute, students shared their ideas with the larger group. Most groups cited precision in measuring as the main cause.

To close the lesson, I wanted to see how well students were connecting their equations to the situation, so I posed the following questions for students to answer in their journals:

-What does the slope of your equation represent?

-What does the y-intercept of your equation represent?

Because more than half of my students speak English as a second language, I like to provide opportunities to write about their thinking, even if it's just a sentence or two, every day. As students leave class, I read over their responses, stacking their journals into two stacks: One of students who demonstrate understanding and one for those who do not. This will help me keep track of students who need additional support through after school tutoring.

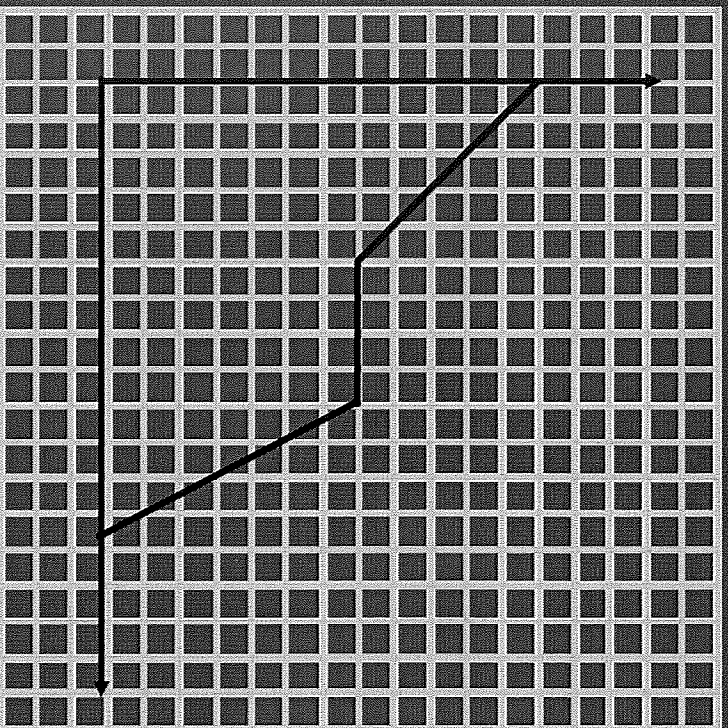
## RESOURCES

 Cup Stacking Closure.pdf <http://betterlesson.com/lesson/resource/2451665/cup-stacking-closure-pdf>

# Warm Up

Write a story that matches this graph.

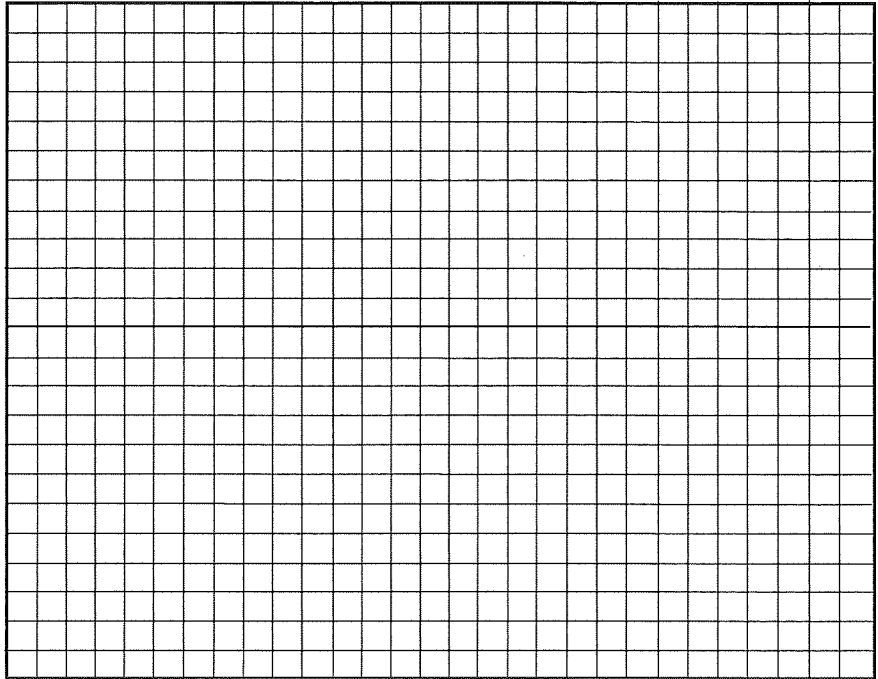
Be sure to label your axes.



# Cup Stacking

You have been hired by a box company to design a box that holds 50 cups. You have only been given a small number of cups as prototypes. You must gather data about the cups you stack and organize it in a table. Then, using your data, graph the information. Use your table, graph or rule to determine the height of the box you need to design for your stack of cups.

# of cups	height (cm) of the stack



What pattern did you find? \_\_\_\_\_

What is the height of the box you will need to hold all 50 cups in one stack? \_\_\_\_\_

How do you know? \_\_\_\_\_

\_\_\_\_\_

**TITLE: Cup Stack Lab**

**PURPOSE:**

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**HYPOTHESIS: If** \_\_\_\_\_

\_\_\_\_\_, **then** \_\_\_\_\_  
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**MATERIALS:**

1. One piece of string per person
2. One rubberband
3. 10 plastic cups

**PROCEDURE:**

1. Place the paper cups on the table, spread out and upside down.
2. Tie your strings to your rubber band. Move the strings out around the rubber so they are spread out (not tied right next to each other).
3. With your group build a pyramid out of the paper cups (four on the bottom, then three on the next row, then two, then finally one on top) using only the string and the rubber band.
4. **Rules:**
  - you may not touch the cups with your hands or any other body part, even if the cups fall on the floor.
  - Each person in your group **MUST** participate by holding onto one of the strings attached to the rubber band. You may not put the string down until your cups are stacked.
  - You must hold onto one of the strings at least 60 cm. away from the rubber band (about two rulers' lengths).

**RESULTS:**

In order to document your results, you will draw a picture under this "flippy" of your group working together to build your pyramid. Your drawing must include the following:

- color
- labels (for each person in your group)
- Your picture should take up half of your notebook page.

**CONCLUSION:**

Answer the following questions below your results drawing. You do not need to write out the questions, just your answers. Restate the questions in your answers. Your answers must be in complete sentences.

1. Was anyone frustrated during the activity? If so, how was it handled?
2. Why was teamwork important for this activity?
3. What are some skills needed to be good at teamwork?
4. What is hard about teamwork?
5. What did YOU do today to contribute to the teamwork of your team?