



# *Bucket, Paper, Scissors*

Low-tech engagement techniques for college math classes  
Dr. Leanne Merrill, Western Oregon University

# *Warm Up*

## Part 1: Find your buddies

Take one piece of paper. Find the other people with papers related to yours. You will be in groups of 3 or 4.

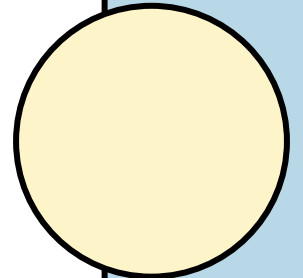
Once you have found each other, sit together, say hi, then pick who is:

- scribe
- researcher (2 people if needed)
- speaker

## Part 2: Explain + expand

Use relevant vocabulary from this unit to explain why your papers are related. Be prepared to share out.

Each group has one equation. Show how you would write that equation in both vertex form and factored forms, explaining any reasoning or steps.

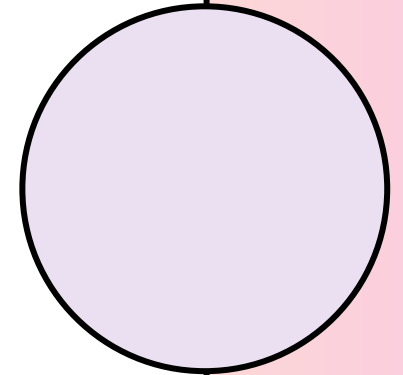


*What knowledge and skills  
did you just use?*

# Why?

## What I Like About Bucket Activities

- “Effective teaching and deep learning require student engagement”  
(*MAA Instructional Practices Guide*)
- Engaged students:
  - Talk to each other and move around
  - Struggle together productively
  - Make connections for themselves
- Feels puzzle-y
- Everyone participates, no one feels pressure
- Better than me yelling “work together” several times to no avail
- Minimal intervention/easy to prep (*Small Teaching* by James Lang)



# *Another example*

## Part 1: Put them in order

Each person in your group should have a single piece of paper.\*

These pieces of paper need to be put in order to state and solve a problem.

Work with your group to determine the correct order.

(\*this has a  $\frac{1}{6}$  chance of actually working but usually you can adapt)

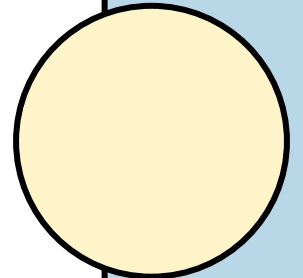
## Part 2: Fill in the gaps + expand

Fill in any details/steps that are *missing* from the solution.

Next, find the domains of both  $f$  and  $f^{-1}$ . Write your answers in interval notation.

Can you find the ranges of  $f$  and  $f^{-1}$ ?  
How?

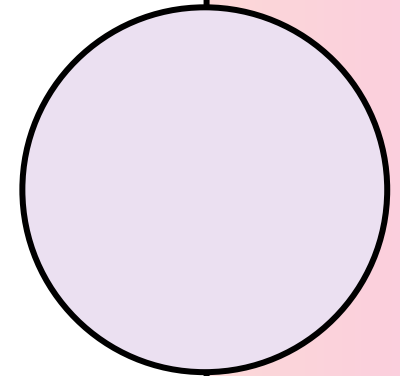
Are there other ways to find  $f^{-1}$ ?



# *When?*

**All the time! Just kidding....but at least a few times.**

- First Day: set expectations around participation
- Warm-ups
- Group-making
- Review activities
- Finding connections
- Tough concepts/processes (“giving them the answers”)
- Categorization/type practice
- Other ideas?



# *One last example*

## **Part 1: Categorize**

You have a few small papers with functions written on them.

Put them in the bucket corresponding to their trait(s).

(Note: there may be more than one correct answer for some of them!)

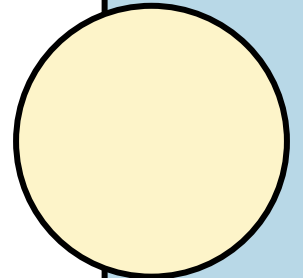
## **Part 2: Assess and correct**

In your group, sort the responses in your bucket.

Which are correct? Why?

Which are incorrect? Where should they go instead?

Be prepared to share out.



# *What?*

## **Describing Relationships**

Example: Quadratic Function Warm Up

Example: Fraction, Percent, Decimal Equivalence

## **Practicing processes**

Example: Finding inverse functions

Example: Using limit laws or Squeeze Theorem

## **Categorization and correction**

Example: End behavior of functions

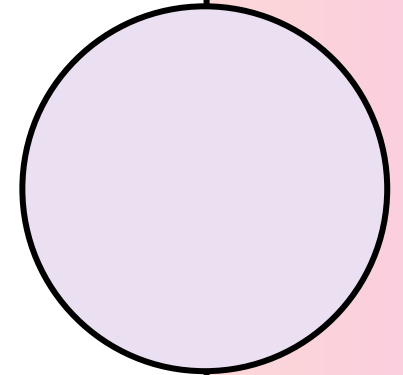
Example: Shapes of probability distributions



# *Considerations*

## **Look before you leap!**

- Fine line between a fun mystery and frustrating confusion
- Not the most “efficient” way to cover material
- Not appropriate for all concepts/activities
- The occasional silent student
- Accessibility for everyone
- Questions that come to your mind?



## *What's on your bucket list?*

How might you use a bucket + paper activity in a class you are teaching in the fall?

Discuss with your group members. After group discussions, we'll share out.

*Thank you!*

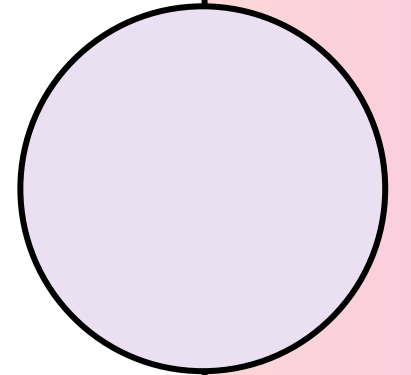
# *References*

Material and ideas in this talk were drawn from:

Quadratic equations from *OpenStax College Algebra*

MAA Instructional Practices Guide

*Small Teaching* by James Lang





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