

# Arguing Constructively in Math Class

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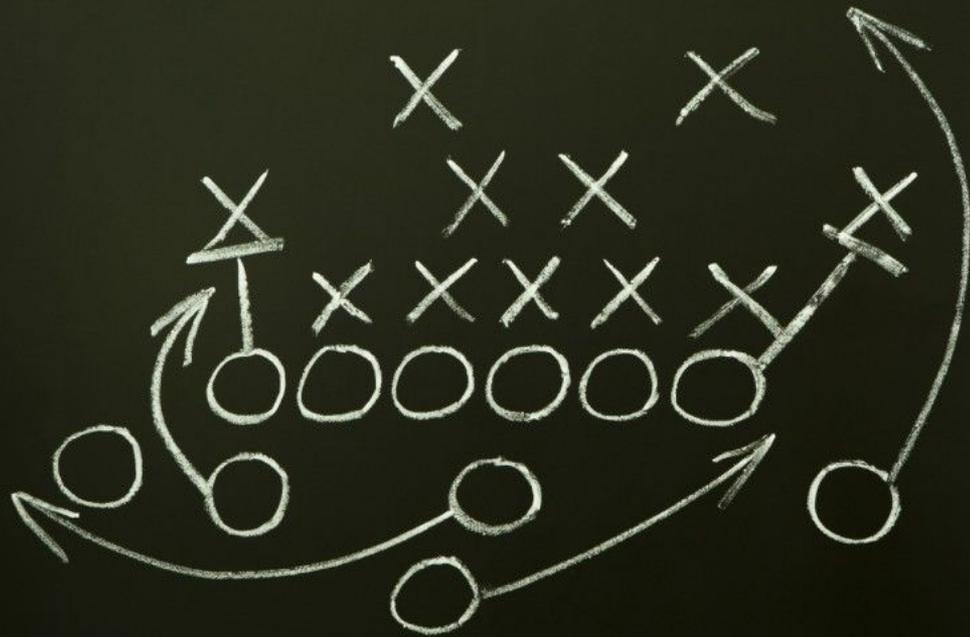
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## Goals:

1. Participants experience the Sharing Skepticism routine.
2. Participants can explain how the routine supports mathematical argumentation.

Instructional routines are routinized “designs for interaction that organize classroom instruction”.

(Magdalene Lampert, NCSM, 2013)



# Instructional routines embed instructional strategies

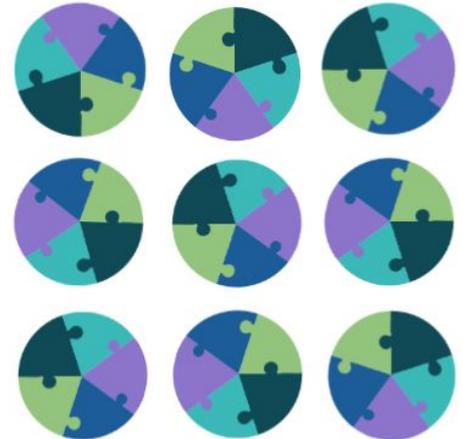
Supports for ALL learners



Instructional routines

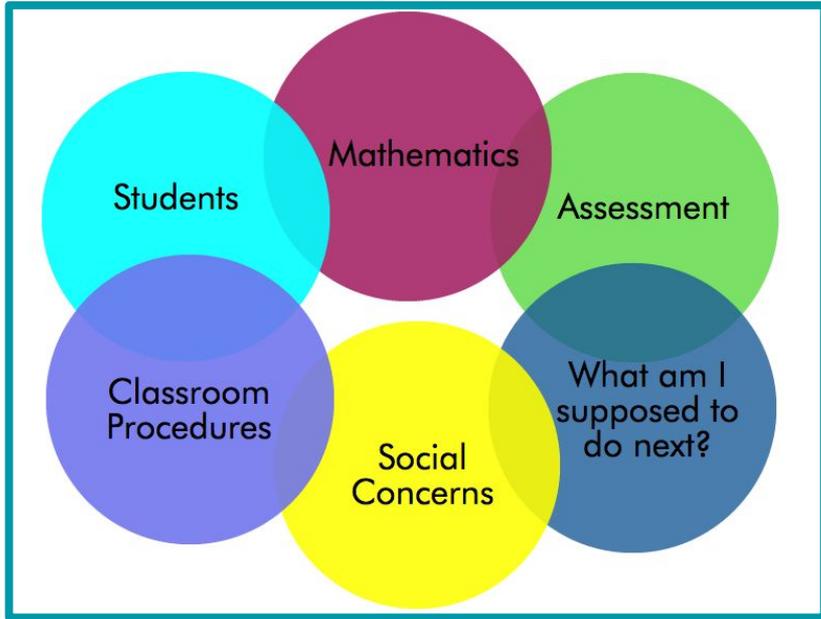


Repeated uses of routines



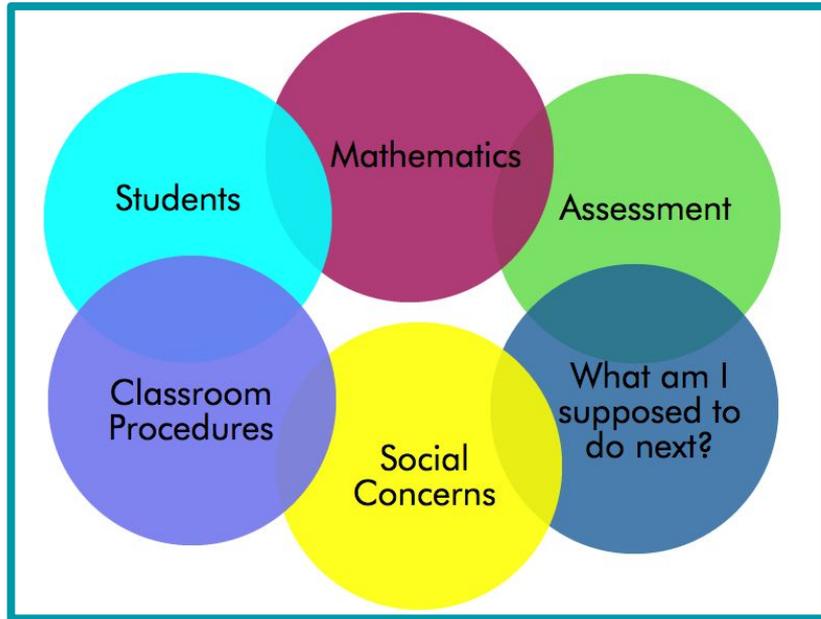
# Cognitive focus in the classroom

***Without*** instructional routines...

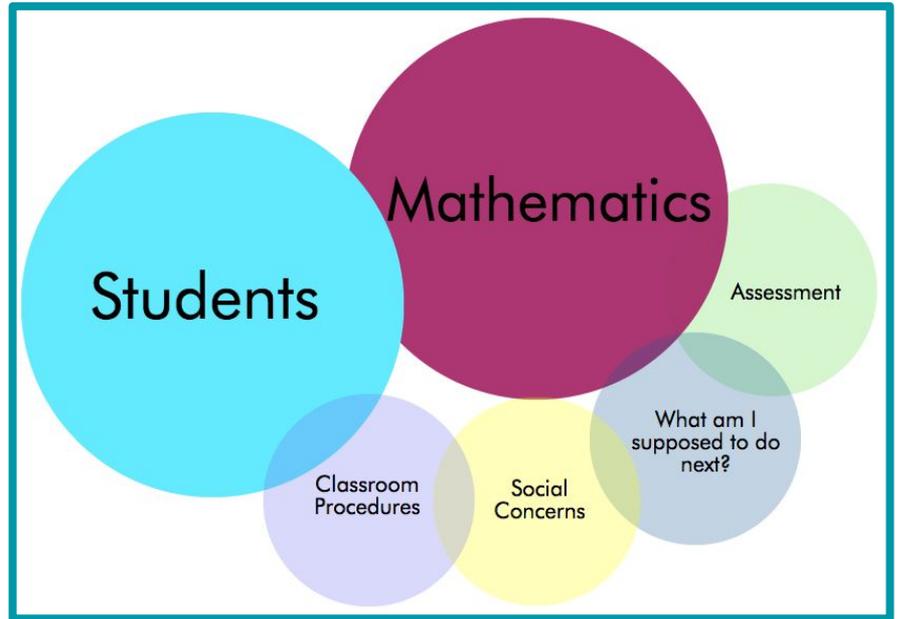


# Cognitive focus in the classroom

**Without** instructional routines...



**With** instructional routines...



# Conversations about teaching

*Without* instructional routines...

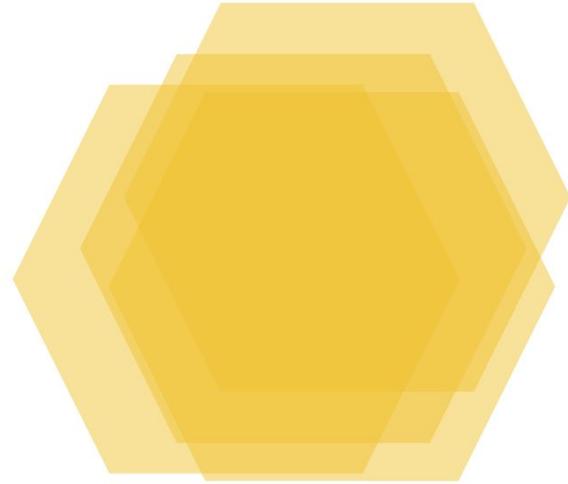


# Conversations about teaching

***Without*** instructional routines...



***With*** instructional routines...



# Sharing Skepticism

## Sharing Skepticism

**WHAT:** To connect visual and algebraic expressions.

**WHY:** To “*argue like a mathematician*”, to construct and critique arguments.



 **THINK like a student**



 **SPEAK like a student**

# Sharing Skepticism

## Sharing Skepticism

**WHAT:** To connect visual and algebraic expressions.

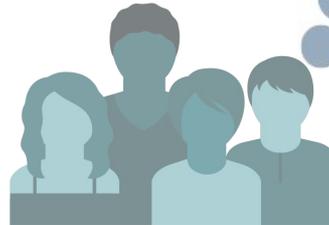
**WHY:** To "argue like a mathematician", to construct and critique arguments.



 **THINK like a student**



 **SPEAK like a student**



Consider the routine

# Sharing Skepticism

## Sharing Skepticism

**WHAT:** To connect visual and algebraic expressions.

**WHY:** To "argue like a mathematician", to construct and critique arguments.



 **THINK like a student**



 **SPEAK like a student**



Consider the routine



# Sharing Skepticism

**WHAT:** To connect visual and algebraic expressions.

**WHY:** To “*argue like a mathematician*”, to construct and critique arguments.



# Sharing Skepticism



**Solve a problem**



**Discuss Arguments**



**Share and Critique Arguments**



**Choose an Argument**



**Reflect on Learning**

# Solve a Problem

## Ask yourself...

How can I make my process and reasoning as clear and convincing to others?



# Solve a Problem

## Ask yourself...

How can I make my process and reasoning as clear and convincing to others?



<b>A</b> 	<b>1</b> $3(x + 6)$
<b>B</b> 	<b>2</b> $3(x + 2)$
	<b>3</b> $3x + 2$

Which visual goes with which expression?

# Solve a Problem

## Ask yourself...

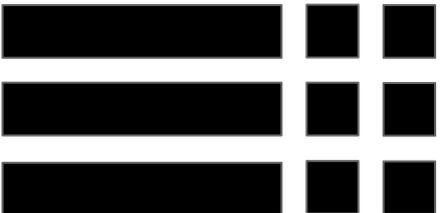
How can I make my process and reasoning as clear and convincing to others?



<b>A</b> 	1 $3(x + 6)$
<b>B</b> 	2 $3(x + 2)$ 3 $3x + 2$

Which visual goes with which expression?

<http://davidwees.com/m/nctmtask>

<p><b>A</b></p> 	<p><b>1</b></p> $3(x + 6)$
<p><b>B</b></p> 	<p><b>2</b></p> $3(x + 2)$ <p><b>3</b></p> $3x + 2$

# Discuss Arguments



“I think... because...”

“This works because...”

“How do you know...?”

“Can you help me understand...?”



# Share Arguments



“We think... because...”

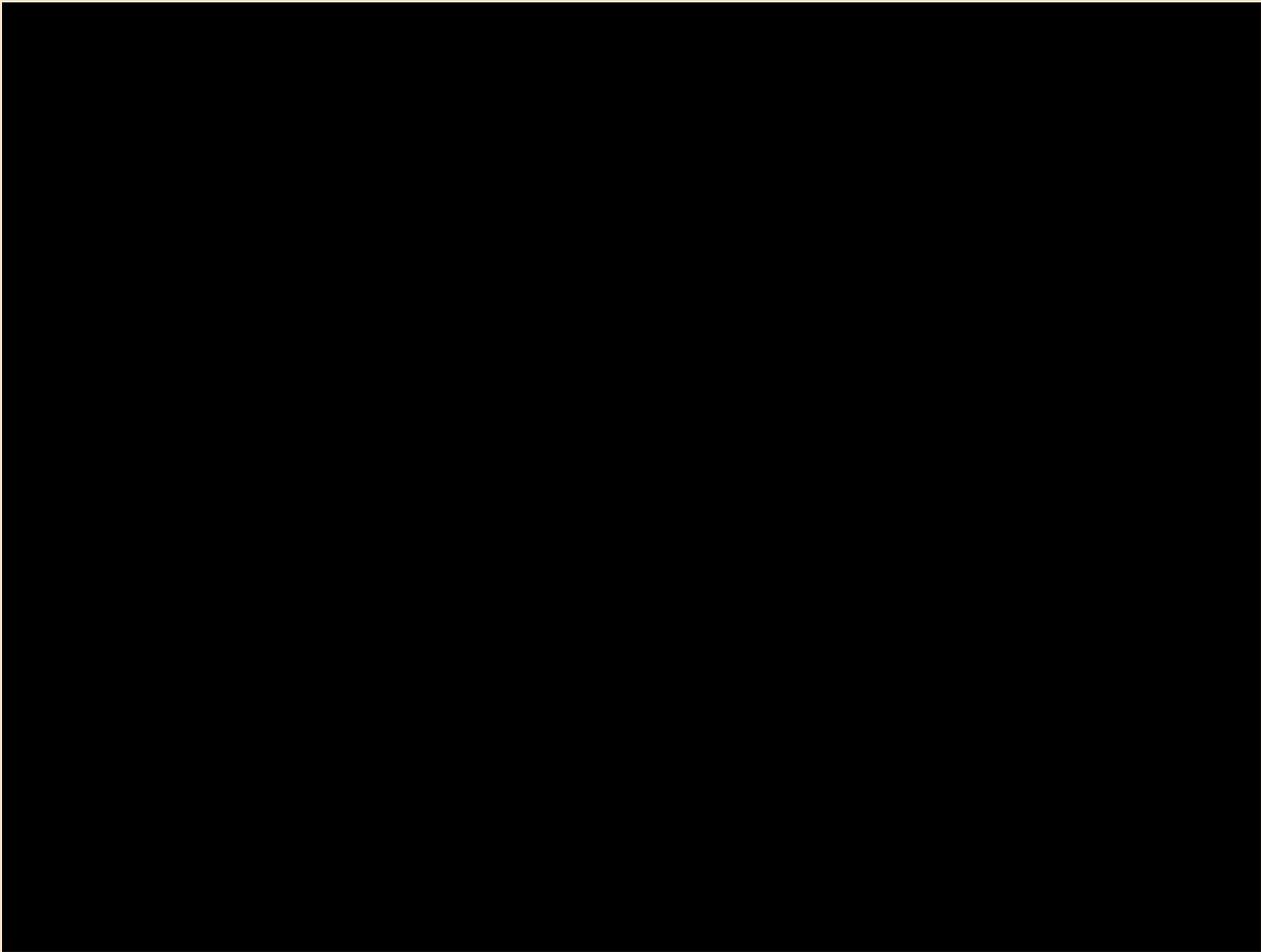
“This works because...”

“They think... because...”

“Their argument works because...”

“We wonder about ... because ...”





Source: <http://curriculum.newvisions.org/math>

# Share Arguments



“We think... because...”

“This works because...”

“They think... because...”

“Their argument works because...”

“We wonder about ... because ...”



# Choose an Argument

**THINK**

**Ask yourself...**

*Which of these arguments  
convinces me and why?*



# Choose an Argument

Argument 1

Argument 2

# Choose an Argument

Argument 1

$$\underline{3}(x + \underline{2})$$

1

	<input type="checkbox"/>	<input type="checkbox"/>
--	--------------------------	--------------------------

2

	<input type="checkbox"/>	<input type="checkbox"/>
--	--------------------------	--------------------------

3

	<input type="checkbox"/>	<input type="checkbox"/>
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Argument 2

$$3(x + 2) = \underline{3x} + \underline{6}$$


<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>

# Choose an Argument

## PAIR

**Decide together on argument you both agree with and be prepared to explain your reasoning.**



**Ask yourselves:** Can we improve the argument?

# Choose an Argument

Ask yourselves: Can we improve the argument?

Argument 1

$$\underline{3}(x + \underline{2})$$

1

--	--	--	--

2

--	--	--	--

3

--	--	--	--

Argument 2

$$3(x + 2) = \underline{3x} + \underline{6}$$


# Choose an Argument

## SHARE

“We found ... convincing because ...”

“We understood ... better because ...”

“We can improve ... by ...”



# Choose an Argument

**Ask yourselves:** Can we improve the argument?

Argument 1

Argument 2

# Choose an Argument

Ask yourselves: Can we improve the argument?

Argument 1

$$\underline{3}(x + \underline{2})$$

1

2

3

Argument 2

$$3(x + 2) = \underline{3x} + \underline{6}$$

# Choose an Argument

Ask yourselves: Can we improve the argument?

Argument 1

$$3(\underline{x} + \underline{2})$$

1	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>

Argument 2

$$3(x + 2) = \underline{3x} + \underline{6}$$

1	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>

# Reflect on Learning



When *constructing* arguments it is important to ...  
because ...

When *critiquing* arguments it is important to ...  
because ...



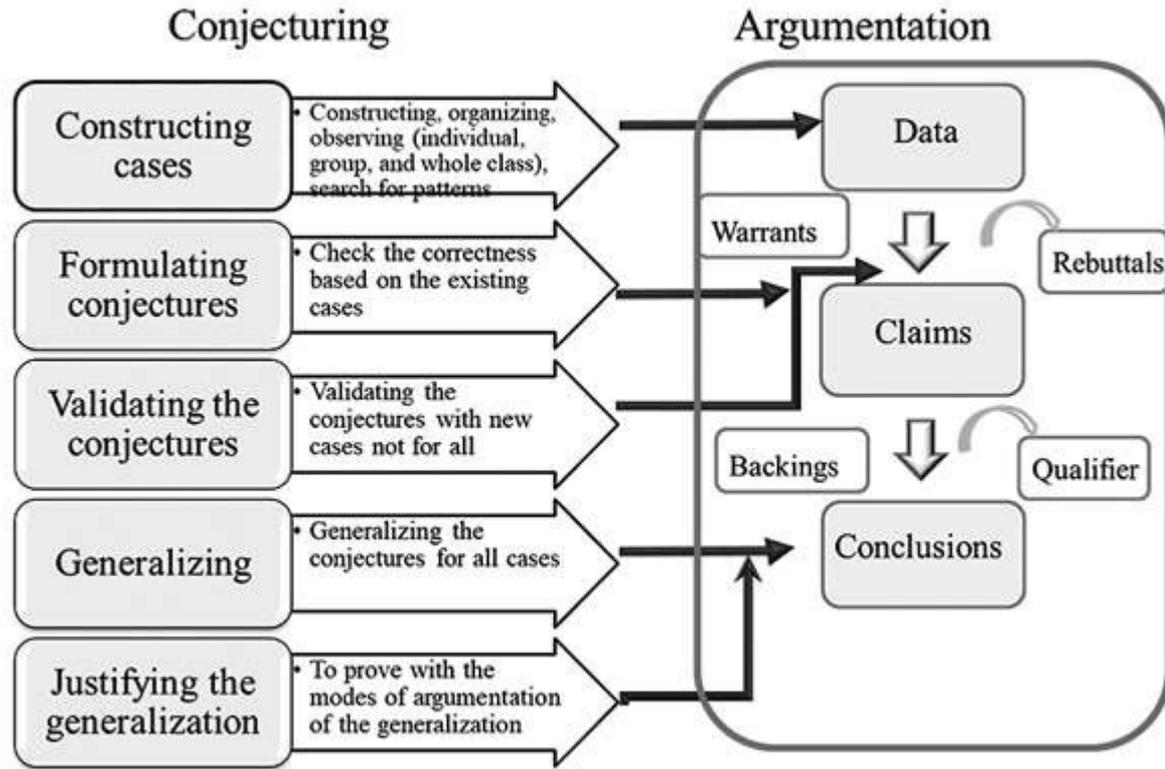
# END of Activity



## Share in the chat window:

- What do you think stays the same each time this routine is used?
- What do you think changes?

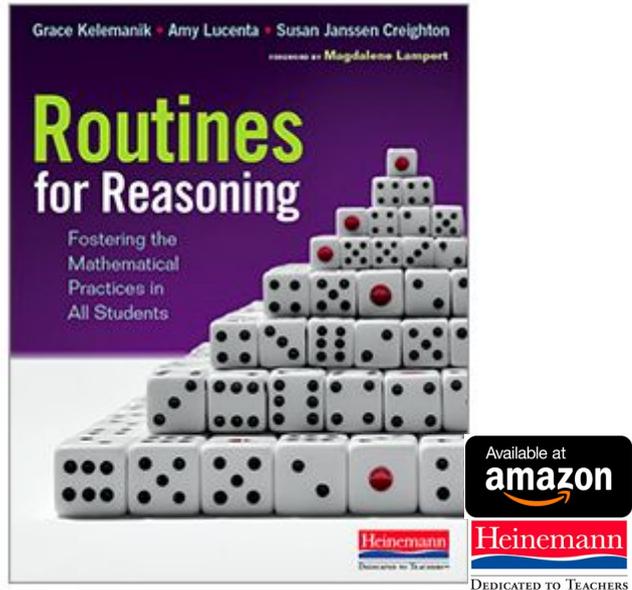
**How does this routine support mathematical argumentation?**



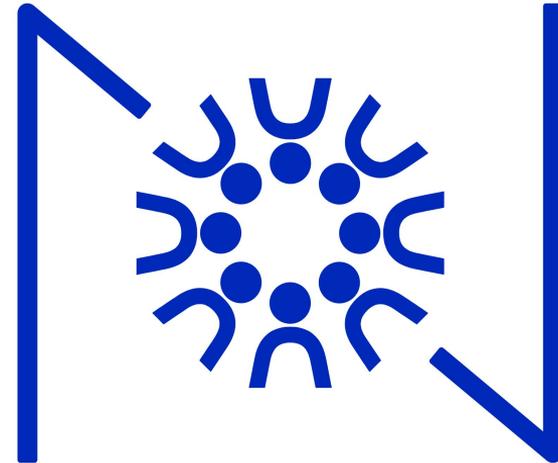
Source: <http://davidwees.com/m/nctmimage>

**Questions about the routine**

# Sharing Skepticism is adapted from:



The Nueva School



# More Resources and Acknowledgements



New Visions  
for Public Schools

Choral Counting  
&  
Counting Collections

ALL\_ED

ALL LEARNERS LEARNING EVERY DAY

## tedd.org



### Ambitious Math Instruction

The Common Core State Standards, based on a growing body of research, call for students to engage in discussion around mathematics and to develop both conceptual and procedural understandings of...

5 0



### Contemplate then Calculate (BPE)

In Contemplate then Calculate attention is shifted away from calculating an answer to interpreting an equation, expression, or shape. This activity was contributed by BPE's Boston Teacher Residency.

4 0



### Three-Act Tasks

This activity is made up of three parts or "acts": 1) The Question, 2) Gathering information, and 3) The Reveal. The entire activity typically takes a full math period or...

2 0



### Mental Math

In Mental Math students solve a computational problem mentally and discuss their solution strategies. The problems selected for Mental Math encourage students to use number relationships, place value, and properties...



### Quick Images

In Quick Images, children are shown pictures displaying groups of objects or symbols, viewing each for only a few seconds. The short period of time encourages children to find efficient...



### Counting Collections

Counting Collections is structured



# Contact Information & Slides

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Email: [davidwees@gmail.com](mailto:davidwees@gmail.com)

Template Slides: <http://davidwees.com/m/nctm2020slides>

Handout: <http://davidwees.com/m/nctm2020handout>

References: <http://davidwees.com/m/citations>