

**+ Engaging students in quality mathematical argumentation**

Day 2: Math Bridging Practices  
Summer Workshop  
Tuesday, June 24, 2014

---

---

---

---

---


---

---

---

**+ Goal – Argumentation Day 2**

- We've talked some about ... *What counts as a valid argument?*
- Tasks and resources: What types of tasks and other resources prompt or support student argumentation?
- We will also consider ... *What does productive argumentation look like in the classroom?*




---

---

---

---

---

---

---

---

**+ Why is justification (mathematical argumentation) so important?**

- For teaching
  - By eliciting reasoning, you gain insight into students' thinking – can better address misconceptions and scaffold their learning
- For learning
  - By reasoning, students learn and develop knowledge (conceptual, linked knowledge, not memorized facts)
  - Equity issue – provide students access
  - In the end, it's more efficient (retention; it's not 'you know it or you don't')
- For assessing
- To support a classroom culture where students can know
  - Reasoning is empowering; merely restating or memorizing information is disempowering and not engaging; reasoning is mathematics
  - Many students can reason very well, even when they have weaker computational skills

---

---

---

---

---

---

---

---

## + Tasks and Questions

- What's so important about Tasks and Questions??

---

---

---

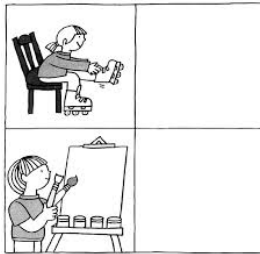
---

---

---

---

## + What will happen next...



---

---

---

---

---

---

---

## + Of course, it's not a one-to-one correspondence...



---

---

---

---

---

---

---

## + Task/Resource Sorting Activity

Review of tasks and resources

Guiding question:

- If a student does what is asked of him or her by the task, or uses the resource to guide his or her work (with reasonable interpretation), will s/he engage *constructing viable arguments and/or critiquing the reasoning of others*?

---

---

---

---

---

---

---

---

## + Task/Resource Sorting Activity

Three categories:

**Likely** to support/engage in cva and cro

**Potentially** will support/engage...

**Unlikely** to support/engage...

---

---

---

---

---

---

---

---

## + Sample 1

- Train A leaves the station traveling due east at 90 mph at 9am. Train B leaves the station traveling due west at 70 mph at 10am. ...




---

---

---

---

---

---

---

---

### + Sample 1

- Train A leaves the station traveling due east at 90 mph at 9am. Train B leaves the station traveling due west at 70 mph at 10am. How far apart are the trains at noon?
- Train A leaves the station traveling due east at 90 mph at 9am. Train B leaves the station traveling due west at 70 mph at 10am. How far apart are the trains at noon? Show your work.
- Train A leaves the station traveling due east at 90 mph at 9am. Train B leaves the station traveling due west at 70 mph at 10am. How far apart are the trains at noon? Explain how you know.




---

---

---

---

---

---

---

---

### + Sample 2

#### Writing in math

#### Student Journal Prompt:

Josie thinks that the quadratic equation  $x^2 + 4x + 6$  has no roots because you cannot factor  $x^2 + 4x + 6$ .

- You're not so sure. Check Josie's claim and decide for yourself.




---

---

---

---

---

---

---

---

### + Your task

- **Think:** Review the tasks/resources on the Handout - Private Think Time for ~5 minutes. There's a set of categories with descriptors you can use for reference as well. *These are meant to guide; not be complete rules.*

- **Pairs-Share:** with a partner at your table, review the tasks/resources. *Take turns being the first to offer your thoughts on the task or resource.*

**Person with the closest birthday should go first and be prepared to share group's thinking.** (~10 mins)

- **Full Group Discussion**

Table #	Focal task
1	A & D
2	B & E
3	C & A
4	D & B
5	E & C
6	A & D
7	B & E
8	C

---

---

---

---

---

---

---

---

+ INSERT SLIDES OF EACH TASK/  
RESOURCE

---

---

---

---

---

---

---

+ *We understand...*  
What are our take-aways?

- Implications for when you design tasks or resources?
- Implications for your work with students?
- What was clarified? Lingering questions?

---

---

---

---

---

---

---

+  
Argumentation  
in action



Video – 7<sup>th</sup> grade math  
class  
Fractions

---

---

---

---

---

---

---

### + The Prompt

$$1 \div \frac{2}{3}$$

*On first glance, how would you rate the cognitive challenge of this task?*

---

---

---

---

---

---

---

### + The Prompt

$$1 \div \frac{2}{3}$$

*CH: "Without doing a rule that you know, like, see if you can make sense of why, what one divided by two-thirds is."*

---

---

---

---

---

---

---

### + Argumentation in action

- Arguments/justifications unfold as part of the math class.

- Cathy Humphrey's video – 15 mins

- From book *Connecting Mathematical ideas: Middle School Video Cases to Supporting Teaching and Learning* (Boaler & Humphreys, 2005). Heineman Press.

---

---

---

---

---

---

---

**+Prior to the Video**

- The teacher talked to her students about her goals for the class—that is, to learn what they *understood* about division, not just what they could *do*.
- 7<sup>th</sup>-grade class. Some know “the rule” and others don’t. Students drawn from “upper” 50% of students.
- For each problem, she asked the students to do two things:
  1. Decide without paper or pencil what they think the answer is
  2. Try to explain why their answer makes sense
- Already discussed  $1/(1/3)$ , so she thought this would be straightforward.

---

---

---

---

---

---

---

**+While Watching**

- What is the claim being discussed?
- What are the arguments that students are making? (Try to mark each argument on your transcript.)
- What is the teacher doing to support (or hinder) students’ engagement with argumentation?
  - Watch for “talk moves” or other pedagogical moves
- What are the students doing that support (or hinder) argumentation?

*Let's watch...*


---

---

---

---

---

---

---