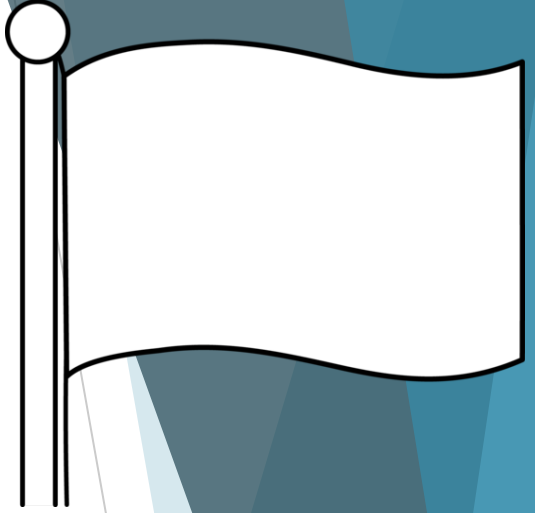
Welcome!



Please work on the **Flag Problem**

Make note of how you think your students would solve this task.

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Beyond Right and Wrong
Responding to Student Thinking

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NCTM Regional Minneapolis

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Please introduce yourself to someone new at your table

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Who's Here Today?

Raise your hand if you are:

- An elementary teacher
- A middle school teacher
- A high school teacher
- A math coach or specialist
- An administrator
- A teacher educator
- Other??

Session Goals

- Examine learning trajectories
- Consider shifts in assessment
- Look critically at student work samples

Learning Trajectory: Three Parts

- Mathematical goal
- Developmental path
- Set of instructional tasks or activities

(Sarama & Clements, 2009)

What could be the Mathematical Goal of the Flag Problem?

- For third graders?
- Older students?

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Key Early Ideas in a Fraction Learning Trajectory

The importance of specifying the whole

Without specifying the whole it is not reasonable to ask what fraction is represented by the shaded area. If the left square is the whole, the shaded area represents the fraction $\frac{3}{2}$; if the entire rectangle is the whole, the shaded area represents $\frac{3}{4}$.

Area representations of $\frac{1}{4}$

In each representation the square is the whole. The two squares on the left are divided into four parts that have the same size and shape, and so the same area. In the three squares on the right, the shaded area is $\frac{1}{4}$ of the whole area, even though it is not easily seen as one part in a division of the square into four parts of the same shape and size.

Learning Progressions Documents:
http://commoncoretools.me/wp-content/uploads/2011/08/ccss_progression_nf_35_2013_09_19.pdf

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Three Shifts

1. **What's Right?**
   Look for what's right in student work

2. **Cite Evidence**
   Describe what you see. Cite specific evidence to support inferences

3. **Anticipate**
   Do the math and anticipate student thinking

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Look for What's *RIGHT in Student Work*

- Find what is right in student work
- Imagine the student's understanding as a point on the developmental path.
- What mathematics are students ready to learn?

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IMPLICATIONS: What is Right?

- Starting point for understanding students' current thinking
- Encourages developmental approach to assessment

By looking at how much of the journey students have covered, you can better plan the rest.

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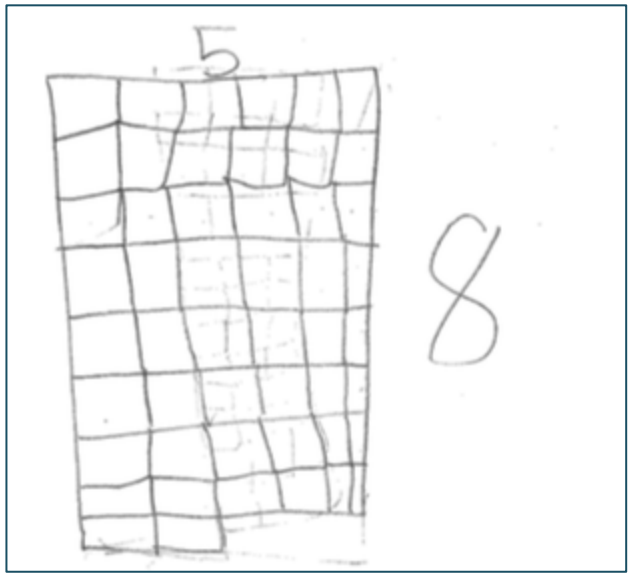
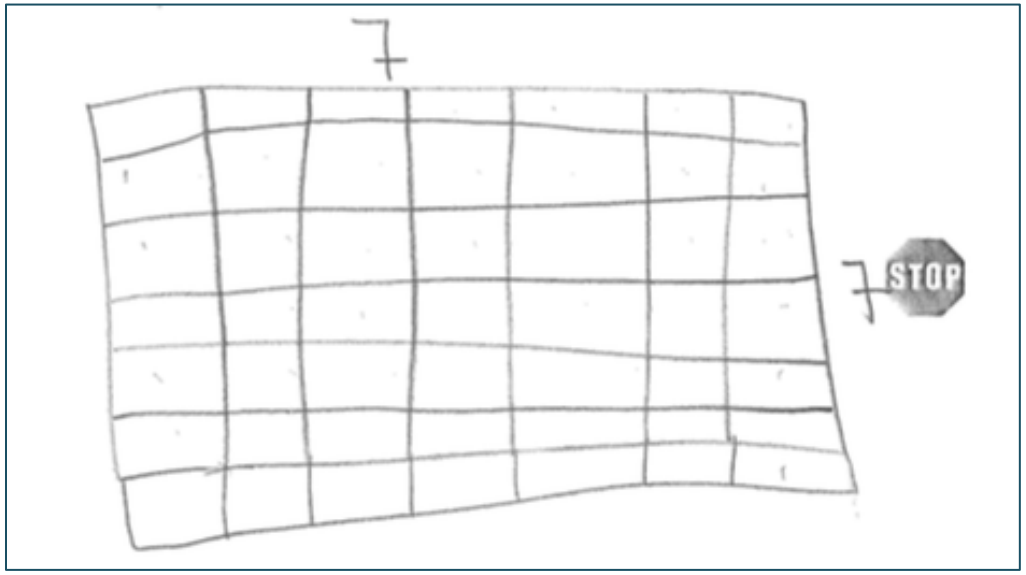
What is Right about this Child's Thinking?

Design a room with whole number dimensions. The room will be 48 square feet. How many options do you have? Draw and label pictures of your rooms.





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Cite Specific Evidence of Thinking

- Check assumptions about students at the door
- Cite evidence shown in work samples only
- Make inferences only after considering many possible explanations

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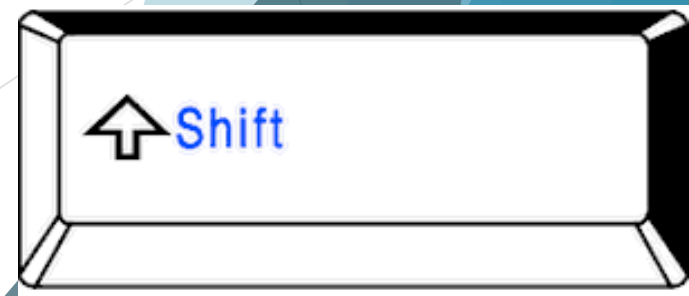
IMPLICATIONS: Cite Evidence

- Evidence depends on students showing their thinking
- For some work, there is little or no evidence
- Relying on evidence lessens over- or under-attribution of understanding

  If students do not show examples or explain their thinking, it is disastrous in the short term, but in the long term you will be more demanding about students showing their thinking



Cite Specific Evidence of Thinking

Comment	Evidence?	Inference?
“She doesn’t understand division.”		
“The right answer is on the paper. There is no other work on this student’s paper.”		
“I mean, she knows what ½ is.”		
“Her drawing does not accurately show 8 parts. Her writing explains that there should be 8 equal parts.”		

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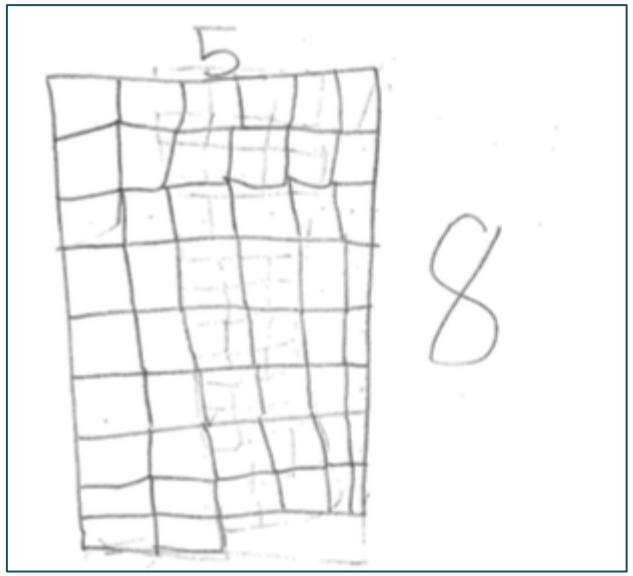
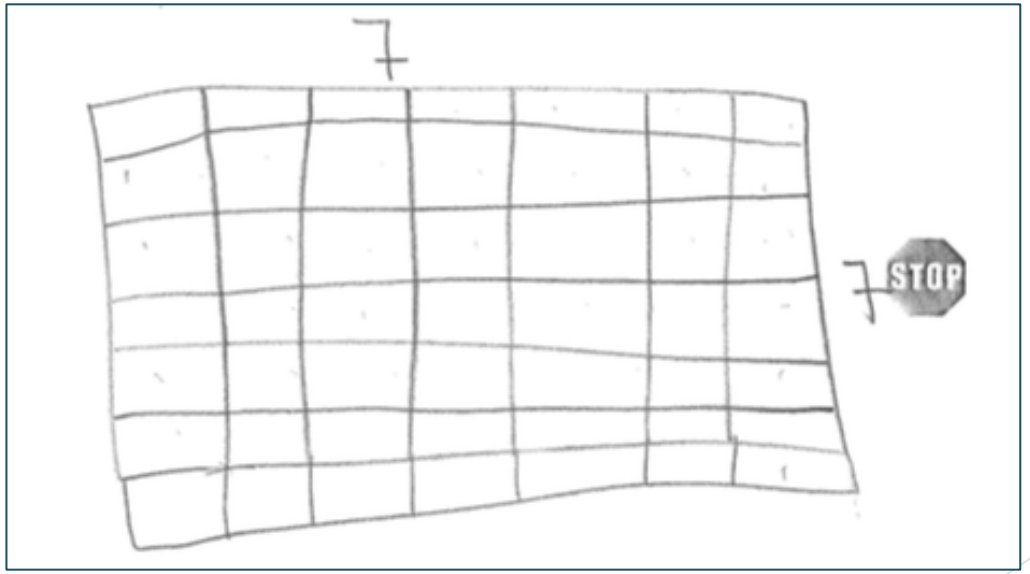
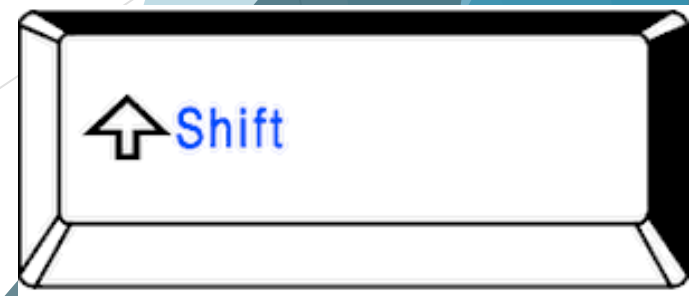
What is Right about this Child's Thinking? Cite Specific Evidence

Design a room with whole number dimensions. The room will be 48 square feet. How many options do you have? Draw and label pictures of your rooms.







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Do the Math and Anticipate Student Thinking

- Do the math first!
- Solve the problem as many ways as possible
- Anticipate student strategies
- Continue to list strategies as you read

(Stein & Smith, 2011)

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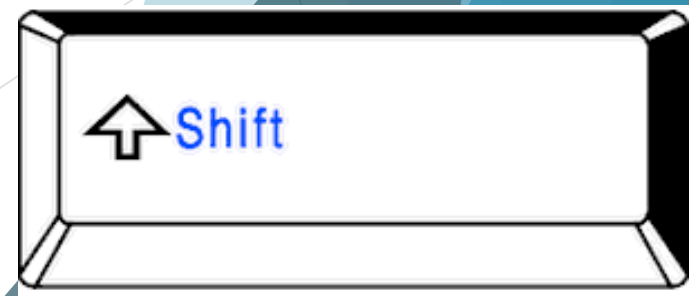
IMPLICATIONS: Anticipate Strategies

By anticipating student strategies, teachers can

- Prepare tools for the assessment task
- Backwards design a lesson or unit in preparation for the assessment task

As you anticipate student responses, this form of preparation can play a role in unit planning.



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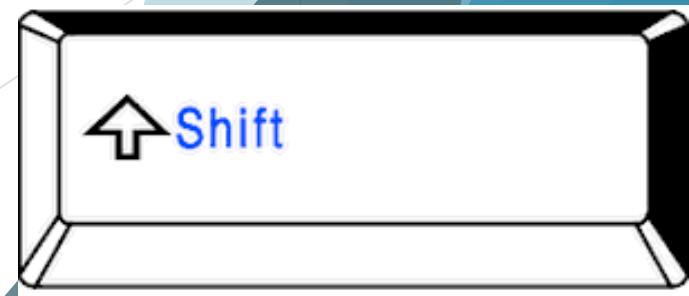
Anticipating the Flag Problem

- What tools would you make available for students to do the Flag Problem?
- What standards could be assessed using this task?



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Examining a Set of Student Work

As you look at student work samples, use sticky notes to write:

- What is RIGHT about the work?
- Cite specific evidence

With your table group, note:

- Important mathematical ideas that emerge
- What you disagreed about

Reflect on Your Practice

Think – Pair – Share

- Think about two things that you are thinking about differently after this session.
- How will this affect your assessment practice?
- Share with your neighbor
- Share at your table

"Effective teaching involves finding the mathematics in students' comments and actions, considering what students appear to know in light of the intended learning goals and progression, and determining how to give the best response and support to students on the basis of their current understanding."

Principles to Actions, p. 56

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