

The background of the slide is a green chalkboard. In the lower-left quadrant, two pink chalk sticks are lying on the surface. One is standing upright, and the other is lying horizontally next to it. Faint white chalk markings are visible on the board, including a large 'A' shape in the bottom left, a curved line in the middle, and a partial circle on the left side.

# Five Important Things to Remember as an Elementary Math Teacher

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## Opening Question

How do you think a child (2<sup>nd</sup> grade) would solve the following problem?

*“Max had 46 comic books. For his birthday, his father gave him 37 more comic books. How many comic books does Max have now?”*

Try to think of at least **TWO** different ways a child would solve this problem.

## Video 1

- In the following video, we see a 2<sup>nd</sup> grader solving the comic book problem (46+37)
- Imagine you're her teacher....
  - Can you describe, mathematically, how her strategy works?
  - How would you react to this strategy?



**(Show Video 1)**

# Video 1

Problem:  $46 + 37$

“46, 56, 66, 76.”

- **Starts at 46, adds 3 tens (30).**

“76, 77, 78, 79, 80, 81, 82, 83.”

- **Starts at 76, adds 7 ones (7)**

$$46 + 30 \rightarrow 76 + 7 \rightarrow 83$$



## Video 1

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- Imagine you're her teacher....
  - Can you describe, mathematically, how her strategy works?
  - **How would you react to this strategy?**

## Video 2

*“Lucy has 38 dollars. One weekend she earned 25 dollars raking leaves for her neighbors. How much money did Lucy have then?”*

- Can you describe mathematically how her strategy works?
- What understanding is this child demonstrating?



A decorative border on the left side of the slide, featuring a green chalkboard background. It includes two pieces of pink chalk, one standing upright and one lying horizontally. There are also some white chalk markings, including a curved line and a large, faint letter 'Y'.

**(Show Video 2)**



## Video 2

### Problem: $38 + 25$

“You could take the \$38 and make it \$40. And then 50, 60, 65. But you have to take away the 2, so that’s 63.”

$$\underline{38} + 2 \rightarrow 40 + \underline{20} \rightarrow 60 + \underline{5} \rightarrow 65 - 2 \rightarrow 63$$

- What understanding is she demonstrating?
  - *Addition and subtraction as inverse operations*
  - *Decomposing numbers into 10s and 1s*

# What about the standard algorithm?

$$\begin{array}{r} 1 \\ 38 \\ + 25 \\ \hline 63 \end{array}$$

*“Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction. A range of algorithms may be used.”*

**Common Core State Standards:** Students first start adding multi-digit numbers in Grade 2, but this “addition algorithm” is not in the Standards until Grade 4.

**Why might there be this delay?**

# Children's Invented Strategies

Invented strategies, like the ones we saw the children performing in the videos:

- Allow students to gain a **conceptual foundation** for properties of number (e.g., place value, commutative, inverse)
- This foundation supports **why** standard algorithms work, so they can be used flexibly and with **understanding**
- Encourage students to be problem-solvers and creative thinkers
- Contribute to number sense and estimation abilities



# The Research Base

- A large research base has shown that when teachers **explore students' invented strategies**, rather than teaching standard algorithms, achievement improves (Carpenter et al., 1989; Fennema et al., 1996; Villasenor & Kepner, 1993)
- This approach is called “**Cognitively Guided Instruction**,” and is one of the single the most influential movements in elementary math education
- Approach heavily accentuated in CCSS, NCTM



# What might this approach look like in a real classroom?

Kindergarten class

*“A bee has 6 legs. How many legs do 5 bees have?”*

## Focus Questions:

- What invented approaches do students use to explore this problem?
- What is the role of the teacher?



**(Show Video 3)**

# Students' Invented Approaches

- Using a number line
- Modeling with blocks
- Counting on fingers



# The Role of the Teacher

- Asks students to present their different strategies
- Asks probing questions
  - *How'd you get your answer?*
- Addresses errors/misconceptions
- Supports, refines, and formalizes important math concepts
  - *"How come you went 6, and then right to 12?"*
  - *"You're really using good thinking."*
  - *I noticed Jeffrey was keeping track [of how many sixes he counted]*





# Five Important Things to Remember as an Elementary Math Teacher

1) Make an effort to understand and explore students' **invented strategies**.

Taking closer look at how children do math, how they think about math, this is an important step to becoming reflective teachers and recognizing the resources that **all** our students may have.



# Five Important Things to Remember as an Elementary Math Teacher

2) Support **each** student's mathematical growth.

If teachers pay attention to students' mathematical thinking, they'll know where each student is, and what supports each student needs to make it to the next mathematical level. Different students will need different scaffolds. Excellence in mathematics education requires equity - high expectations and strong support for all students.

# Five Important Things to Remember as an Elementary Math Teacher

3) Create a classroom environment where students' feel “**safe**” making mistakes.

Children, just like adults, learn better in supportive environment in which they can risk trying out new strategies and stretching themselves intellectually. Encourage students to communicate their thinking and establish communities of learners.





# Five Important Things to Remember as an Elementary Math Teacher

4) Engage students in **classroom discussions** about their mathematical ideas.

When children discuss their reasoning, it allows them to clarify and extend their own thinking. It allows other children to consider and compare different approaches, and decide what makes sense to them. And it indicates to the teacher what different students understand.



# Five Important Things to Remember as an Elementary Math Teacher

5) **Formalize** students' mathematical thinking.

As students describe their thinking, as the teacher it's your responsibility to make explicit the important mathematics concepts they are using (e.g., addition and subtraction as inverse operations), and to revoice their thinking in terms of formal operations, standard algorithms, and proper terminology.

# Ticket Out

As a teacher, what might be some of the **challenges** of using an approach like the one in the video?

