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What Do We Believe About Teacher Learning and How Can We Learn With and From Our Beliefs?

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For copies of the slides, and further information, please go to:

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Opportunity and challenge: Combining action with inquiry

- Rising demand
- More and different resources

Three premises about the contemporary context of mathematics teacher education

- Widespread interest, strong beliefs
- Pressures to claim that an approach "works"
- Weak warrants for knowledge claims

Commonly-held and sometimes competing beliefs about mathematics teacher learning

- Pedagogy and curriculum of teacher education
- Structure of teachers' opportunities to learn
- Nature and scope of the mathematics that teachers need to know
- The role of curriculum materials in teachers' practice

The pedagogy and curriculum of mathematics learning opportunities

- Should model the pedagogy to be used with students, *or*
- Teachers need to experience mathematics in the same ways as their students

Consider:

- What is "modeling"?
- Why – or when – might this idea make sense?
- Why – or when – might it not make sense?

$$1\frac{3}{4} \div \frac{1}{2}$$

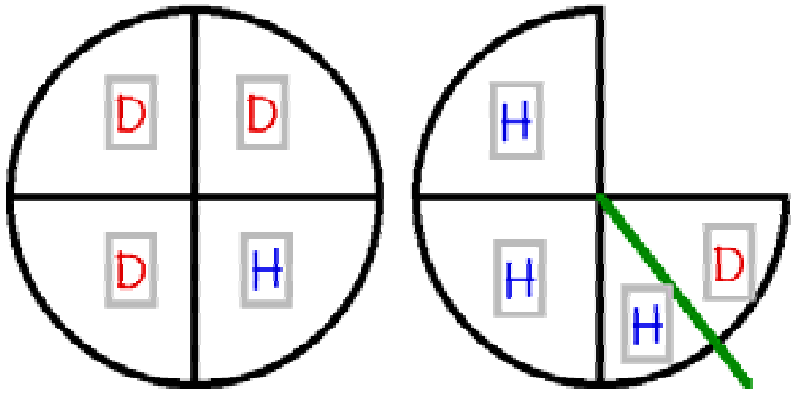
Calculate the answer.

Write a story problem for the expression:

$$1\frac{3}{4} \div \frac{1}{2}$$

Common adult approach

I had two pizzas . My roommate ate 1/4 of one of them, and then I had 1 3/4 pizzas left. I shared the remaining pizza with one of my friends. How much pizza did we each get?



1. The pedagogy and curriculum of mathematics learning opportunities

- Should model the pedagogy to be used with students, *or*
- Teachers need to experience mathematics in the same ways as their students

Consider:

- What is "modeling"?
- Why – or when – might this idea make sense?
- Why – or when – might it not make sense?
- What would it take to learn from modeling?
- What are some of the risks?

2. The structure of teachers' learning opportunities

- One-shot workshops are bad; long-term work is good, work with colleagues is good, lesson study is good.

Consider:

- How does the curriculum of teachers' learning opportunities interact with the structure?
- What structures are important –– time, social, knowledge –– and how do they interact with what is being learned?

3. The nature and scope of the mathematics that teachers need to know

- Teachers need to understand in depth the content they teach.
- Teachers need to know mathematics beyond what they will teach.

Consider:

- What are the mathematical tasks central to teaching?
- What are the mathematical issues with which teachers contend?
- How do students and contexts shape the mathematical work of teaching?
- How might the issues differ across mathematical domains or practices?
- How different or the same are the answers at the elementary, middle, and secondary levels?

Subtraction

$$\begin{array}{r} 1002 \\ -\ \ 493 \\ \hline \end{array}$$

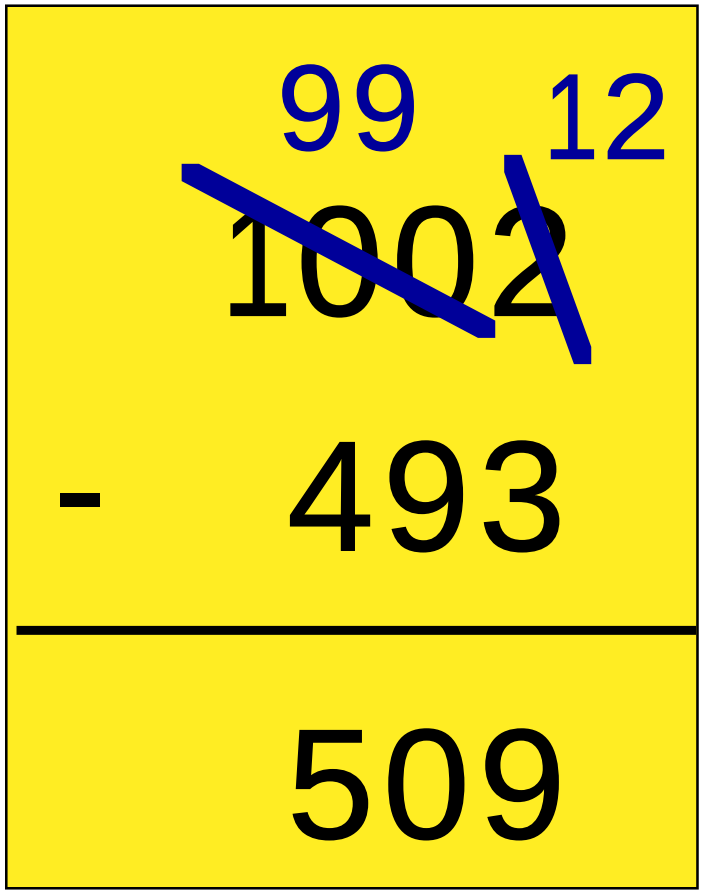
$$\begin{array}{r} {\scriptstyle 0}\ {\scriptstyle 9}\ {\scriptstyle 9}\ {\scriptstyle 12} \\ 1\not{0}\not{0}\not{2} \\ -\ \ 493 \\ \hline 509 \end{array}$$

Subtracting “across zeroes”

$$\begin{array}{r} 1002 \\ -\ \ 493 \\ \hline 509 \end{array}$$

$$\begin{array}{r} {\scriptstyle 0\ 9\ 9\ 12} \\ 1\cancel{0}\cancel{0}\cancel{2} \\ -\ \ 493 \\ \hline 509 \end{array}$$

A student proposes a different way:



How should the teacher respond?

What mathematical questions must the teacher consider in order to decide what to do?

Make these questions explicit.

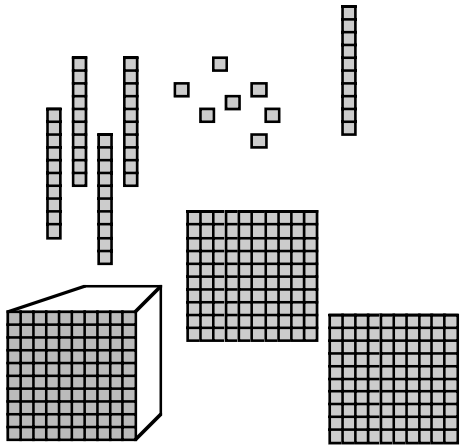
Answer them.

Modeling subtraction: Building correspondences between objects, numbers, operations, and algorithms

Use base ten blocks to show how any of the methods for

$$\begin{array}{r} 1002 \\ -\ 493 \\ \hline \end{array}$$

work.



Using contexts for

$$\begin{array}{r} 1002 \\ -\ 493 \\ \hline \end{array}$$

- Sensitivity to and familiarity with students' **experience**
- Concern for mathematical **integrity**
- Attention to possible **distortion** or distraction
- Cultivation and care for **interest**

Making connections and anticipating the mathematical horizons

Examples

- Place value structure and the power of algorithms
- Renaming and rewriting numbers
- Developing more efficient methods
- Considering generalizability
- Examining equivalences across methods

Conclusion:
What mathematical knowledge is needed for teaching subtraction?

$$\begin{array}{r} 1002 \\ -\ \ 493 \\ \hline \end{array}$$

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4. The role of curriculum materials in teachers' practice

- Good teachers make their own problems, task, don't follow textbooks. Teachers' guides "de-skill" and "de-professionalize" teaching.
- Textbooks provide teachers with structure, sequencing, ideas, guidance, tools.

Consider:

- How do teachers use textbooks and teachers' guides?
- What does it mean to use materials and tools professionally?
- Is there a difference between "prescriptive" and "elaborated"?
- How do (or can) teachers learn from curriculum materials?
- How does this differ by teachers' experience, knowledge, or by mathematical topic, or by level?

Using and challenging our beliefs to create better knowledge

- Subjecting our beliefs to examination and test
- Unpacking favorite (and not favored) ideas
- Considering different teachers and contexts, different content and levels
- Investing more in explicit design, so that we can compare alternatives with more precision
- Developing methods and tools to gather valid evidence
- Engaging in more public exchange based on evidence

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