Intentionally Promoting Conceptual Understanding:

Is Your Division Model Just Another Algorithm?

Welcome

Gena Holley

- Math Specialist, Madison County Schools, Mississippi
- 23 years in the classroom (4th, 5th, 6th grades)
- 2nd school year as a Math Specialist

Who's in the Room?

- Administrators
- Coaches
- Interventionists
- Classroom Teachers
- Special Education Teachers
- Students

Who's in the Room?

- 0 to 3 years of experience
- 4 to 9 years of experience
- 10 to 15 years of experience
- More than 15 years
- More than 25 years

Who's in the Room?

- Long Division/Standard Algorithm
- Only Manipulatives and Division Pictures
- Somewhere in the Middle

Expected Outcomes for Today's Session

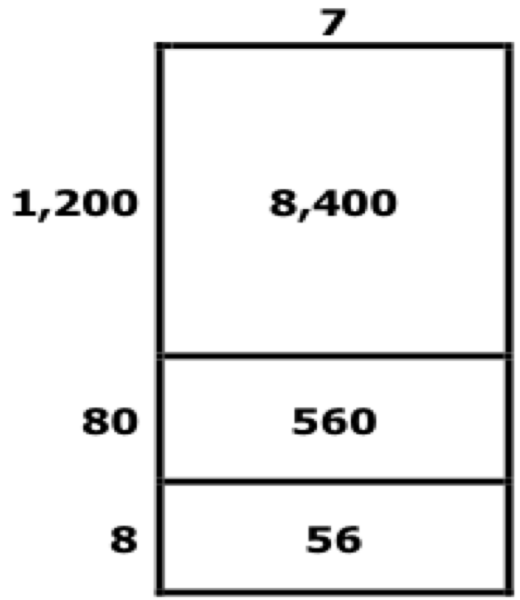
- *Awareness* of conceptual understanding
- *Strategies* for shifting instruction from procedural to conceptual
- *Affirmation* that you are already moving in the right direction!

from WellTrainedMind.com

- "Conceptual math" is shorthand for mathematics instruction that clearly explains the reasons ***why operations work*** as they do. It is often contrasted with "procedural math," which teaches students to solve problems by giving them a series of steps to do. Conceptual math ***explains why*** the algorithm works.
- Procedural math is important; students should learn the algorithms. But ***mathematical literacy involves learning both the procedures and the reasons why they work***.

The Inspiration....

24. The quotient of 9,016 ÷ 7 can be found using the division model.



Which equation shows the final step in finding the quotient?

A 1,200 + 640 + 64 = 1,904

B 1,200 + 560 + 56 = 1,816

C 1,200 + 80 + 56 = 1,312

D 1,200 + 80 + 8 = 1,288

I have a question about the process on 4th grade final benchmark test number 24. Why is the final step 1200+80+8 rather than 1000+200+80+8? I thought the point was teaching division through place value. I've been teaching my classes they can't put more than one number in a given place and the partial quotients should be like expanded form for the quotient. It is like when multiplying 2345x4 we find the expanded form of the number first then find the area for each rectangle inside the model. Does this make sense?

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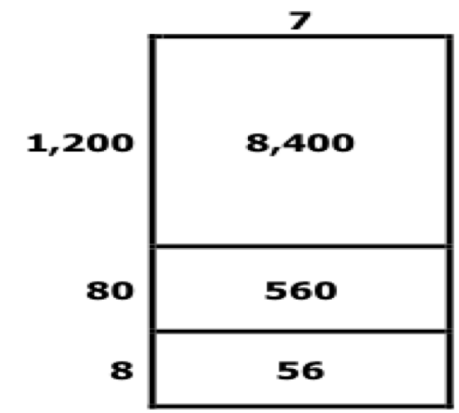

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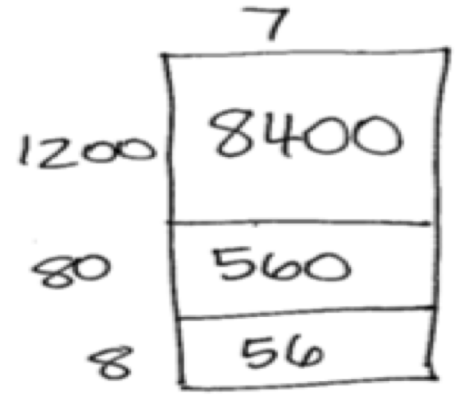
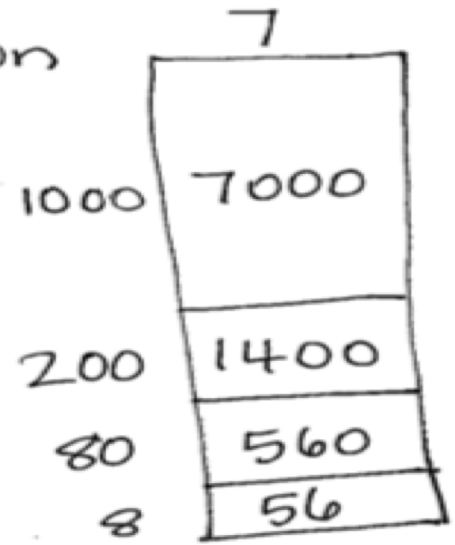
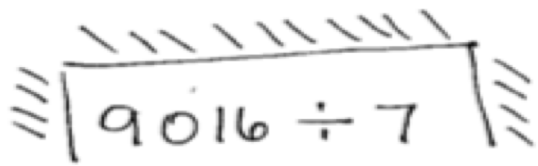
on the test



your suggestion

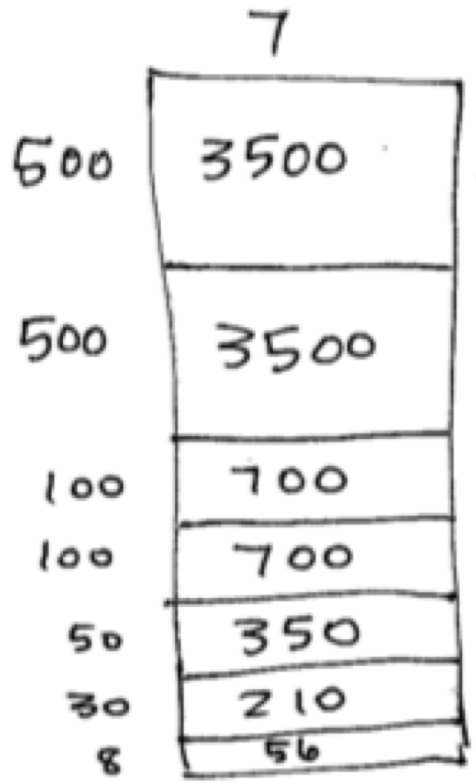


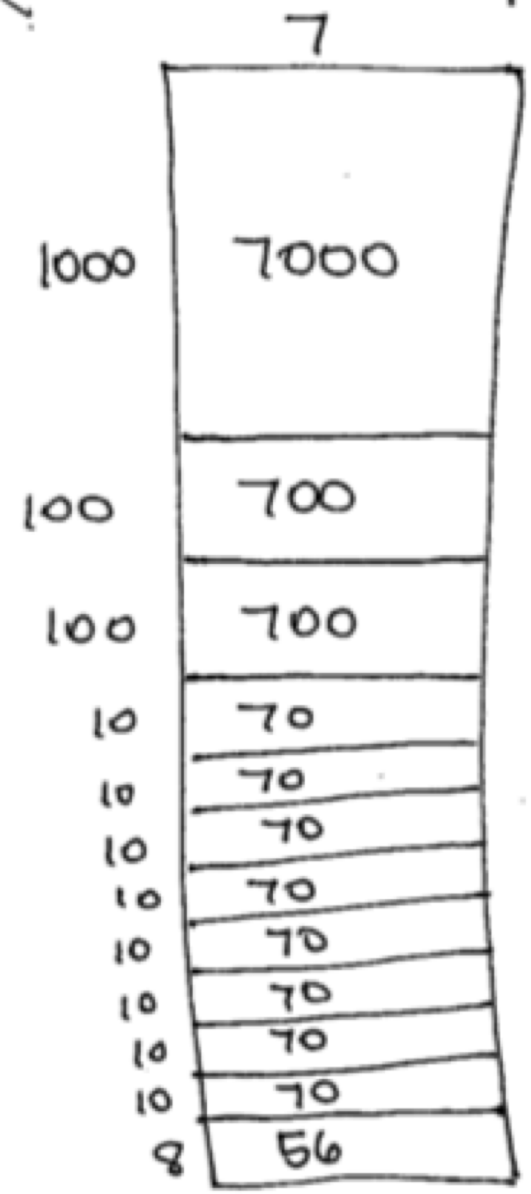


a different way

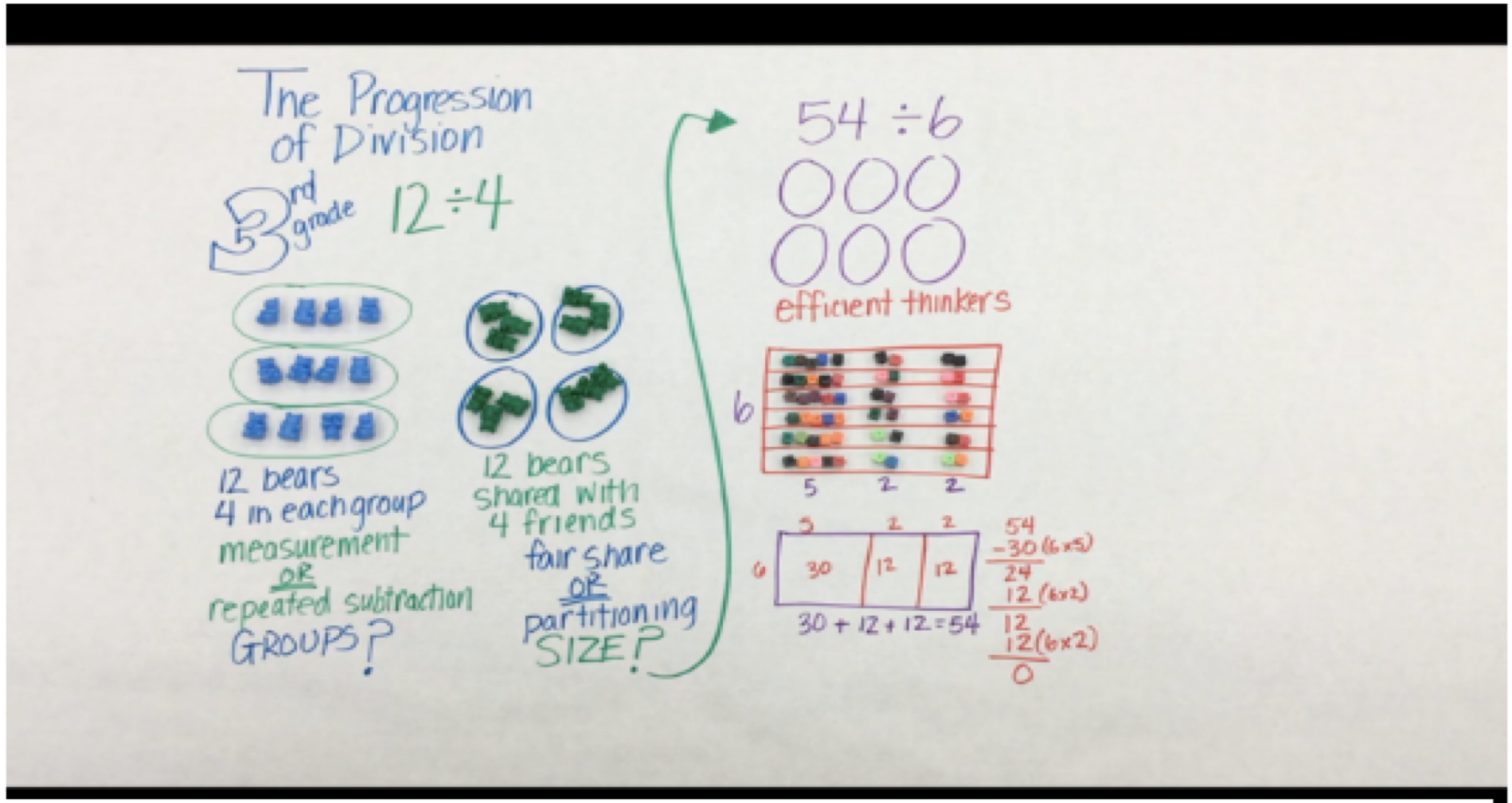
9016 ÷ 7

another option

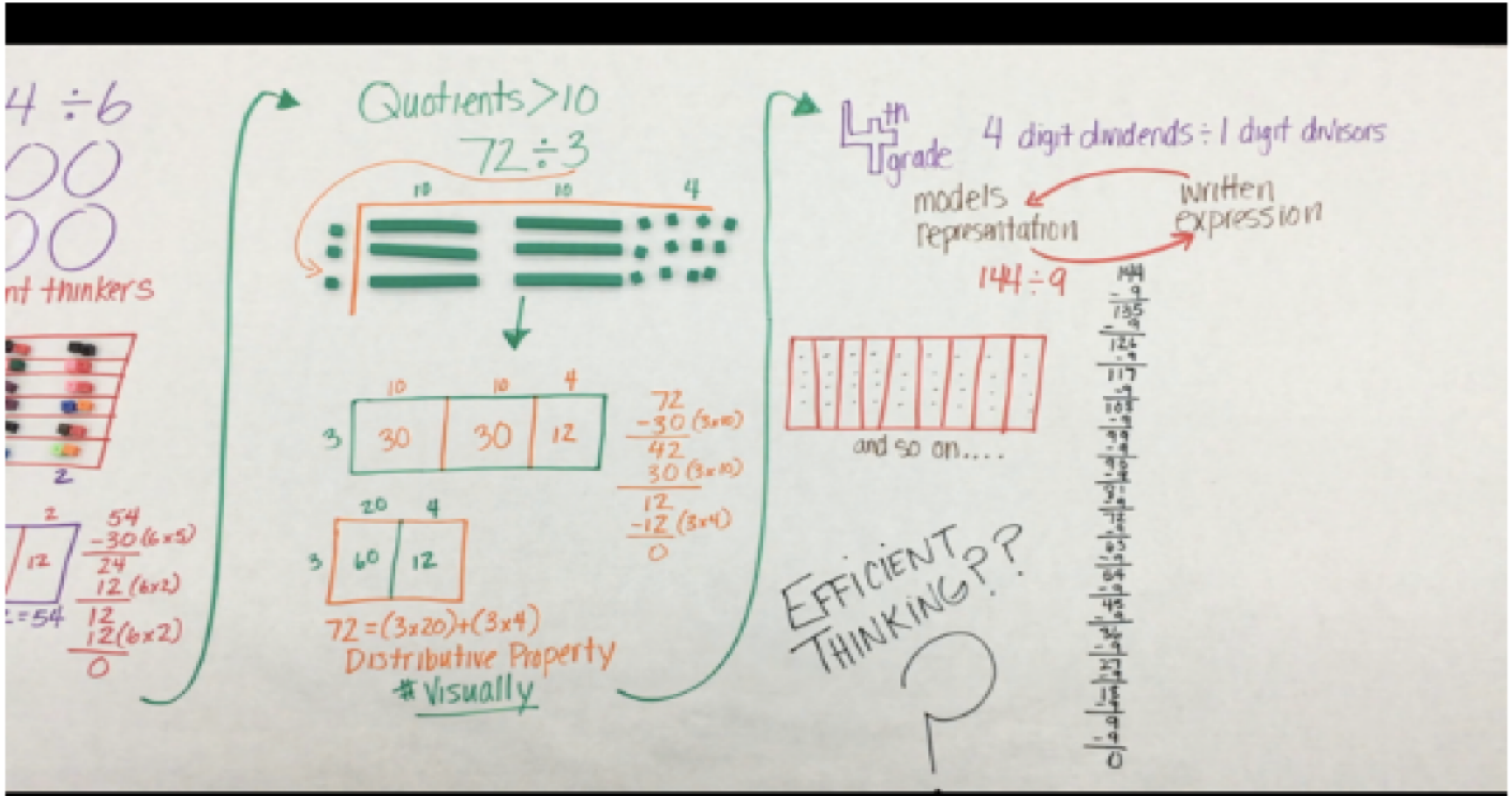




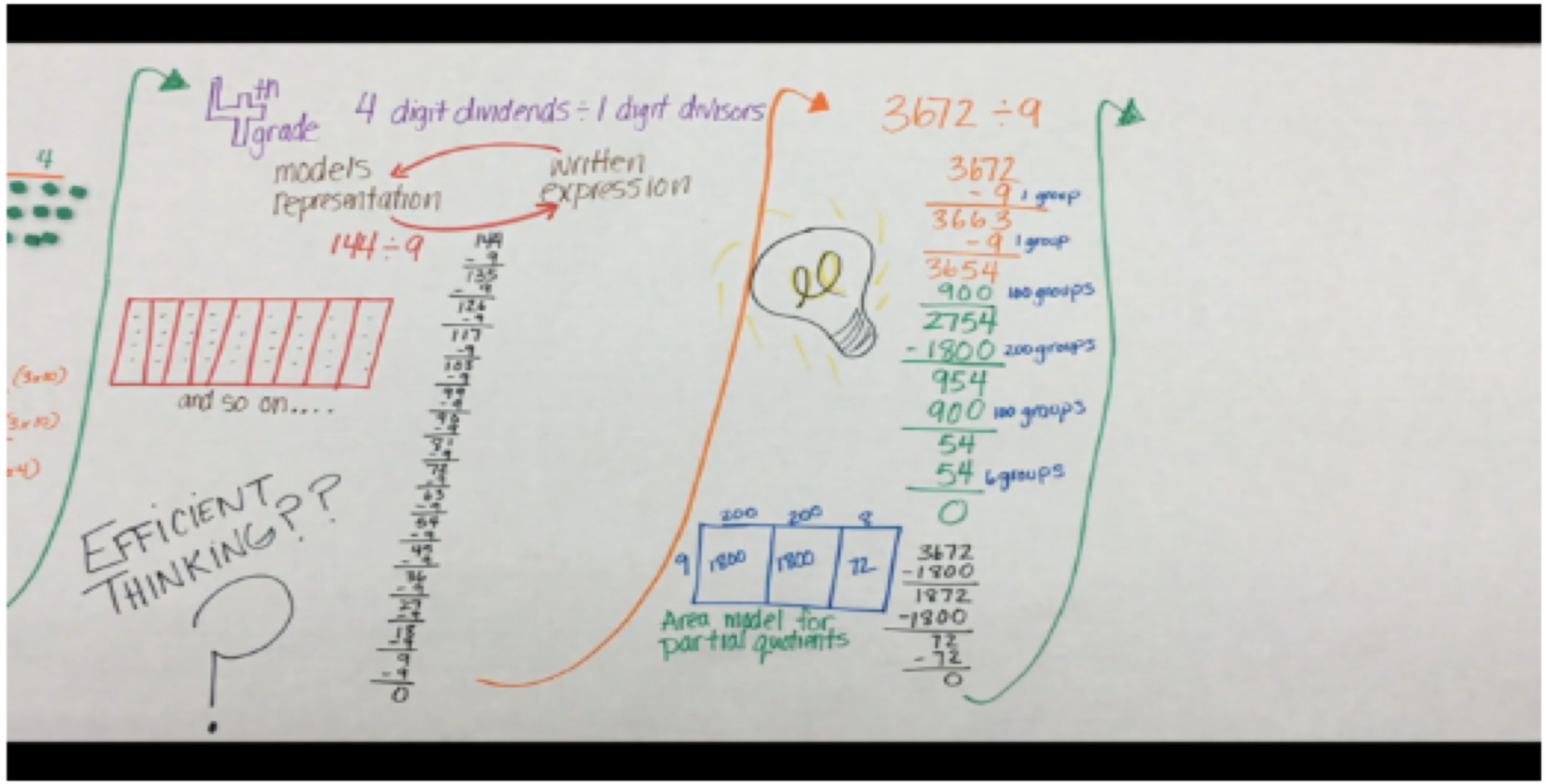
Graham Fletcher's Making Sense Series: The Progression of Division



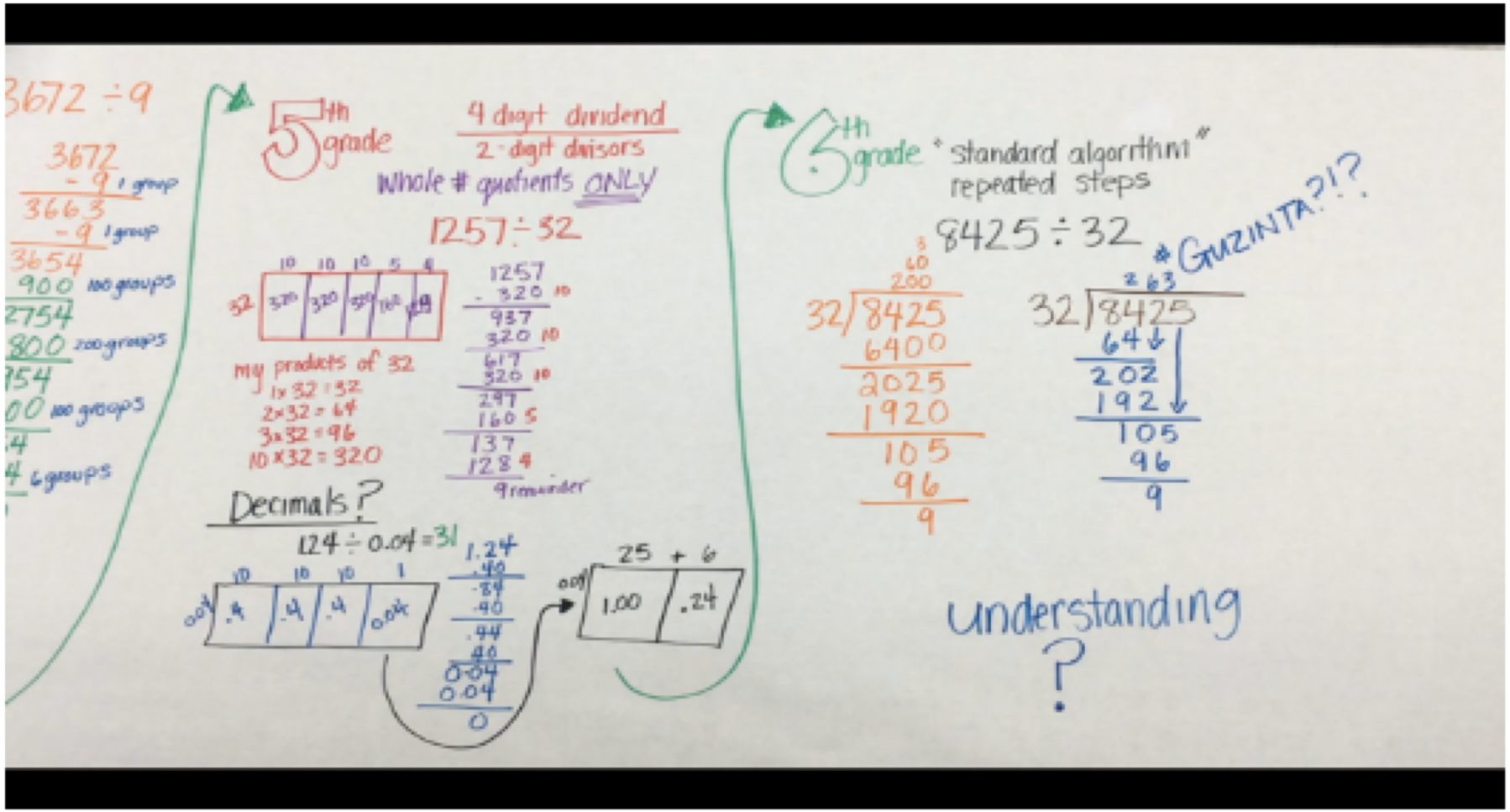
Students move from concrete models to pictorial representations before they move to abstract (symbols).



Students make connections between division and multiplication and continue to make connections between the model representations and written expressions.

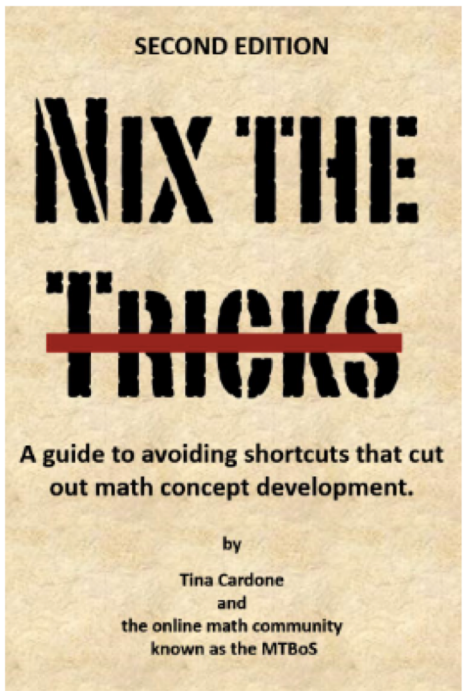


Students become efficient thinkers when they can make sense of the math. Again, connections between multiplication and division are made.

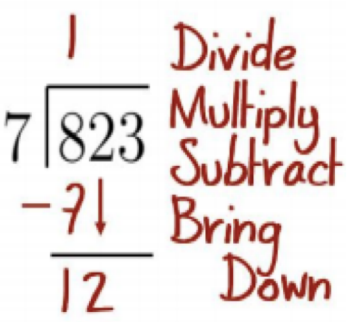


Continue using area models and place value strategies in 5th grade, transitioning to the standard algorithm in 6th grade.

Nix the Tricks



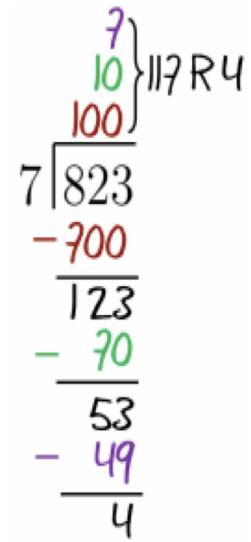
2.6 Nix: Does McDonald's Sell Cheeseburgers, a.k.a. Dad, Mom, Sister, Brother



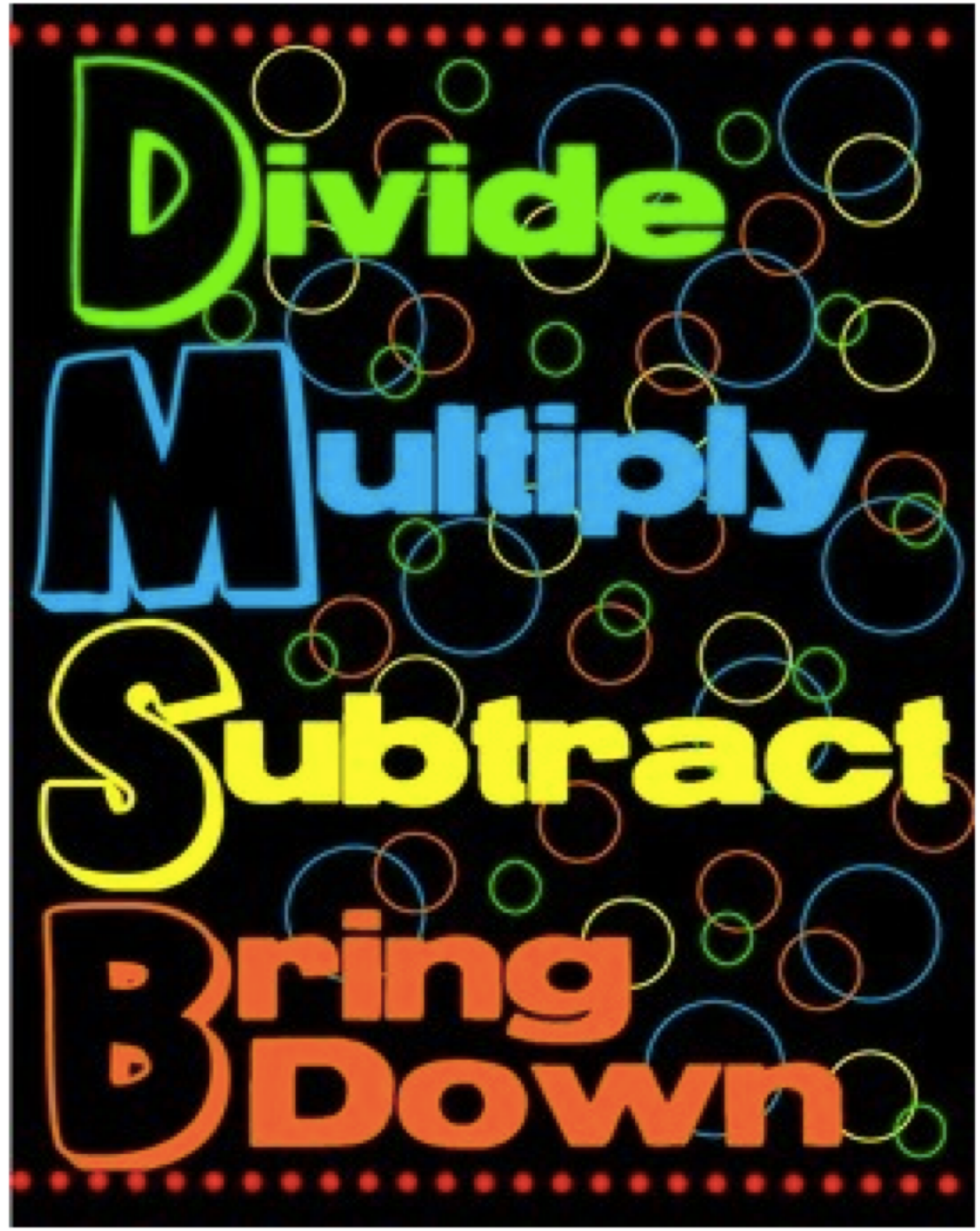
Because:

Students should understand the process, not memorize a procedure. Not to mention the fact that it is just as hard to remember the order of the family members in this arbitrary mnemonic as it would be to remember arbitrary operations. Describing the process without understanding leads to confusion; what mathematical operation is equivalent to 'bring down the 2?'

Fix:



Students cannot see place value when using the standard algorithm for dividing. Adding some color and writing out the entire number helps make the process more transparent. So does allowing students to take away less than the maximum amount each time - students will learn that the process goes faster if they maximize at each step, but there is no harm in taking two steps to do something if it helps students feel more confident.


Divide
Multiply
Subtract
Bring Down

Turn and Talk

- What math curriculum does your school use?
- Does your school's curriculum use DMSB?
- What are some alternative division strategies that you use?