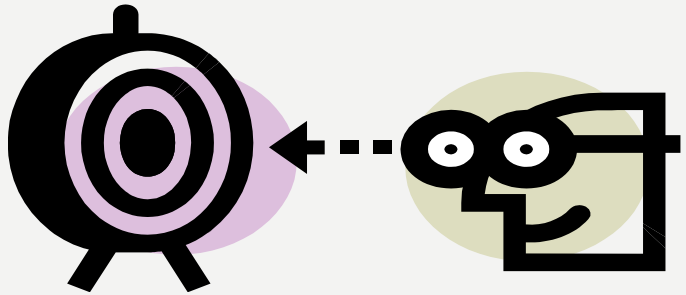
TRICKS ARE NOT FOR KIDS!

SHIFTING FROM "ANSWER GETTING" TO THINKING AND UNDERSTANDING

DR. ALISON J. MELLO – NCTM ANNUAL 2018

GOALS OF THIS SESSION



- Explore how common tricks undermine student understanding
- Discover how to use math tools to help students make sense of math
- Ditch the tricks for good!

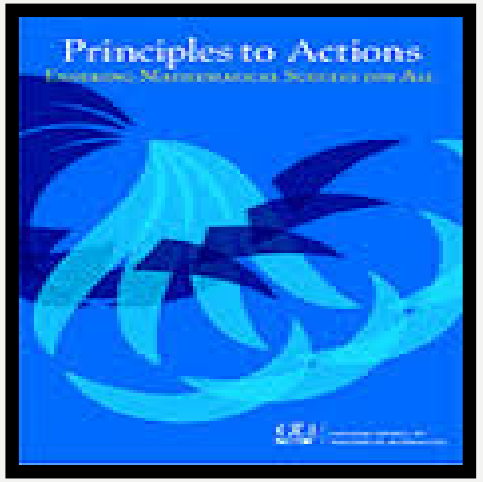
EVERYDAY CHALLENGES…. SOUND FAMILIAR???

- **MINDSET: Students give up too easily**
- **CULTURE: Students expect everything to be explained**
- **APPLICATION: Students struggle to apply knowledge**

REFRAMING THE WAY WE SUPPORT STUDENTS IN MATH

Dan Meyer

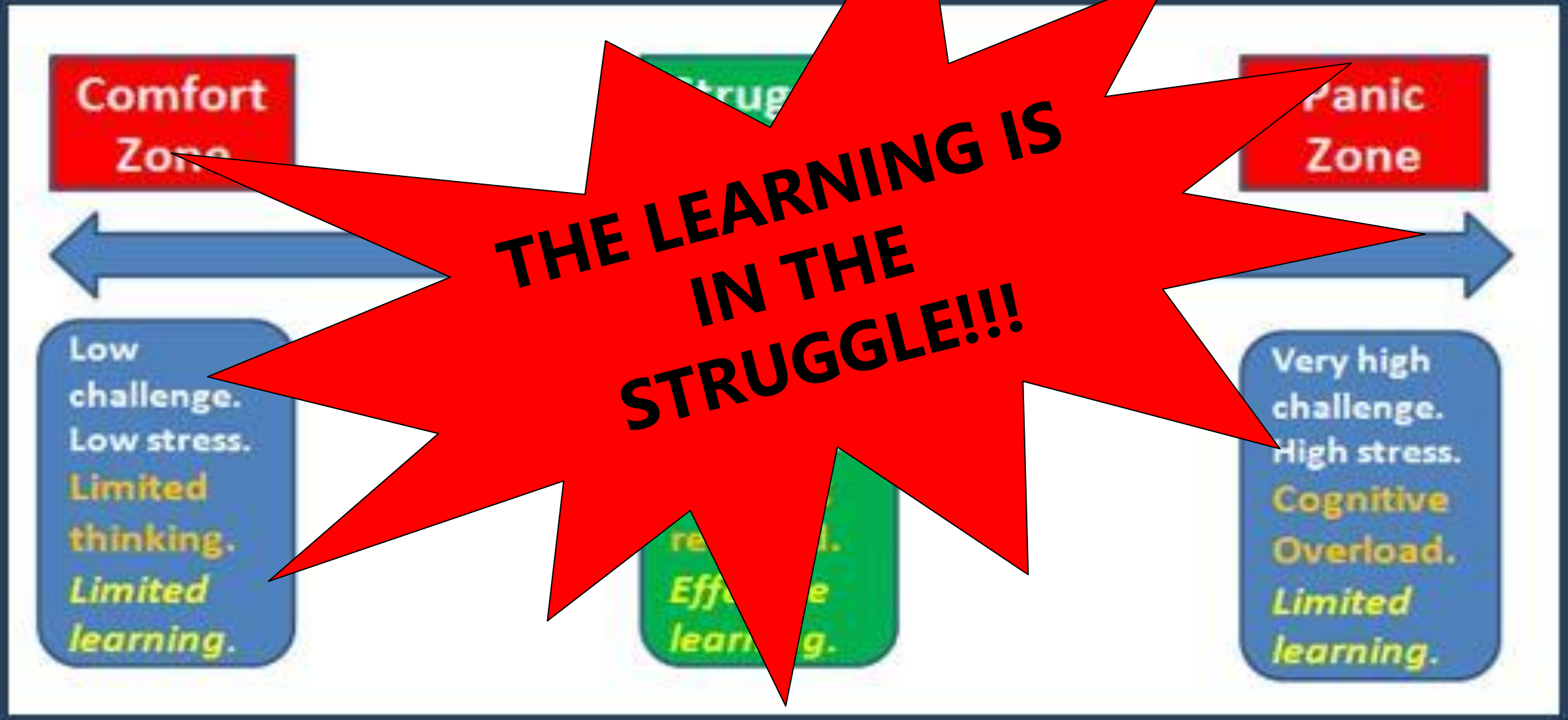
PRINCIPLES TO ACTIONS:
ENSURING MATHEMATICAL SUCCESS FOR ALL

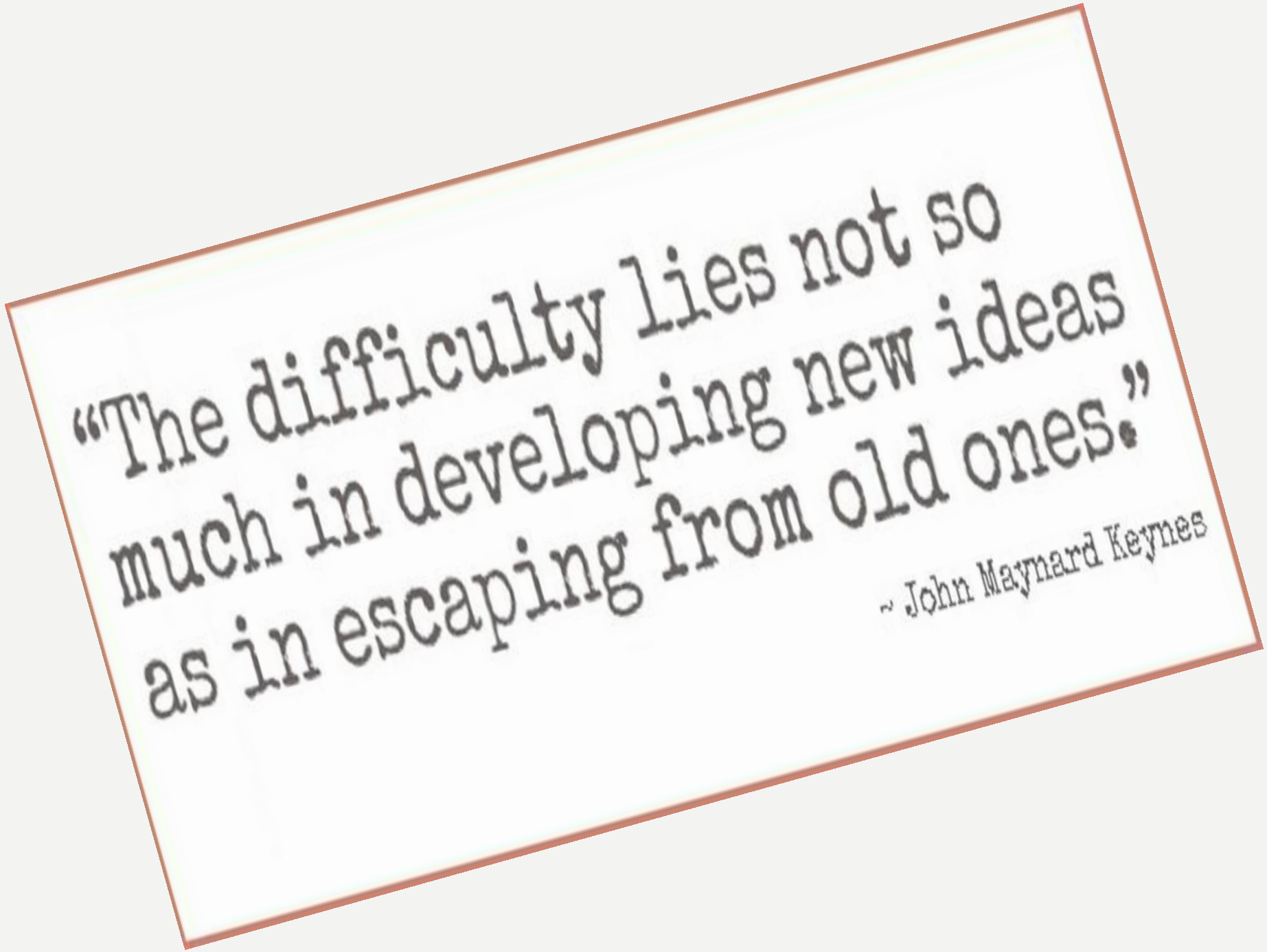


Mathematics Teaching Practices

- Establish mathematics goals to focus learning.
- Implement tasks that promote reasoning and problem solving.
- Use and connect mathematical representations.
- Facilitate meaningful mathematical discourse.
- Pose purposeful questions.
- Build procedural fluency from conceptual understanding.
- Support productive struggle in learning mathematics.
- Elicit and use evidence of student thinking.

Keep them in the struggle zone



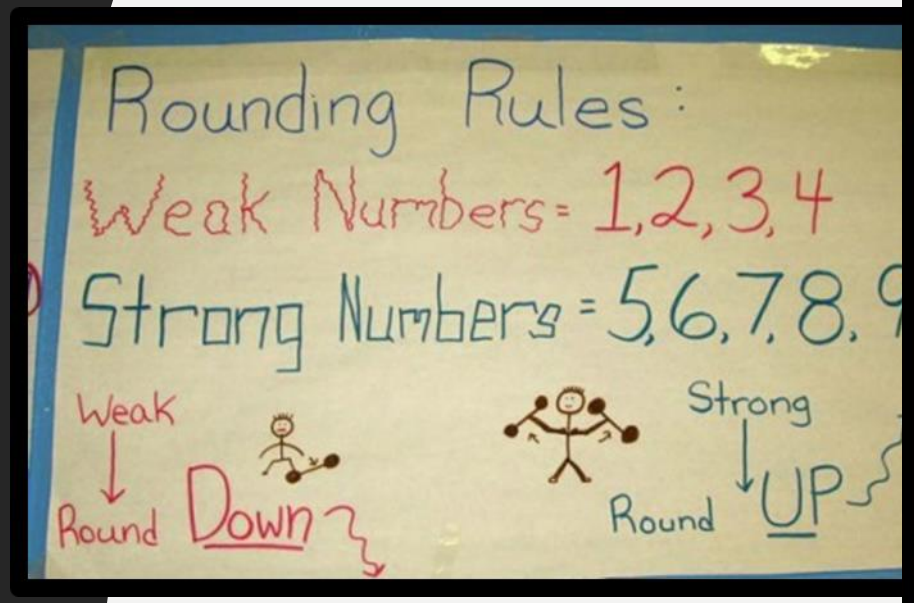

"The difficulty lies not so much in developing new ideas as in escaping from old ones."
~ John Maynard Keynes

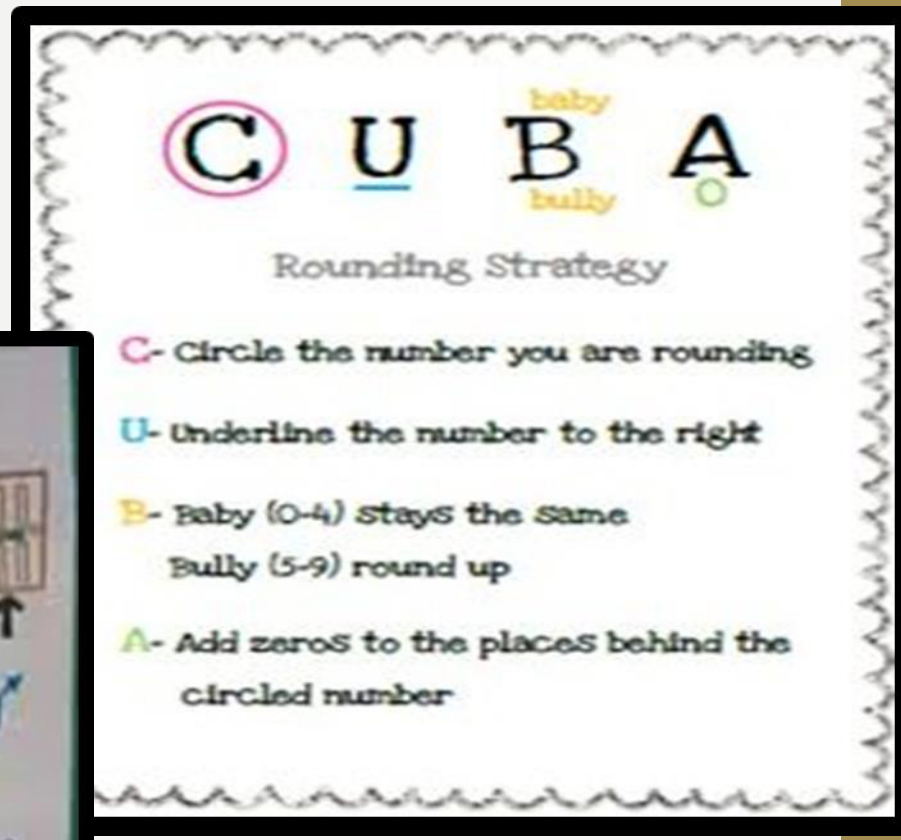
WHAT ARE SOME TRICKS THAT YOU KNOW?

(WE WON'T TELL ANYONE….IT'S OKAY!)

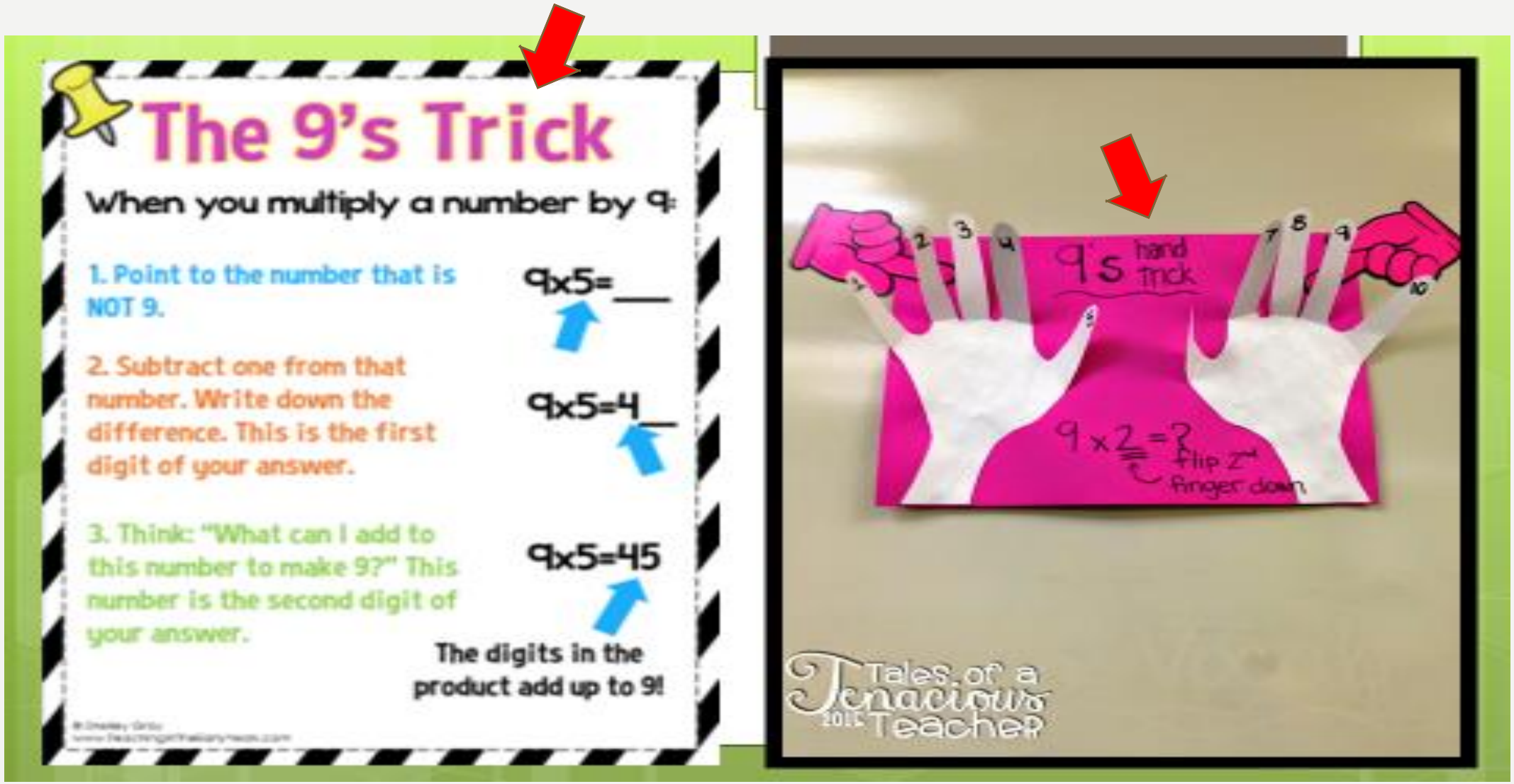
TURN and TALK

LET ME GUESS……ROUNDING TRICKS?

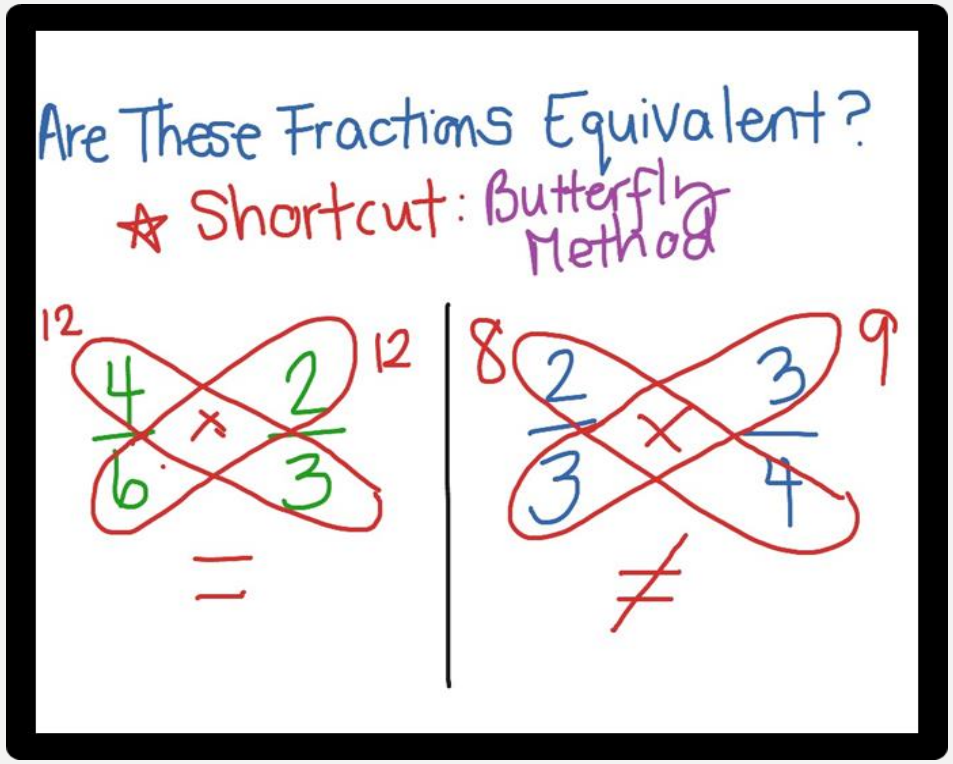


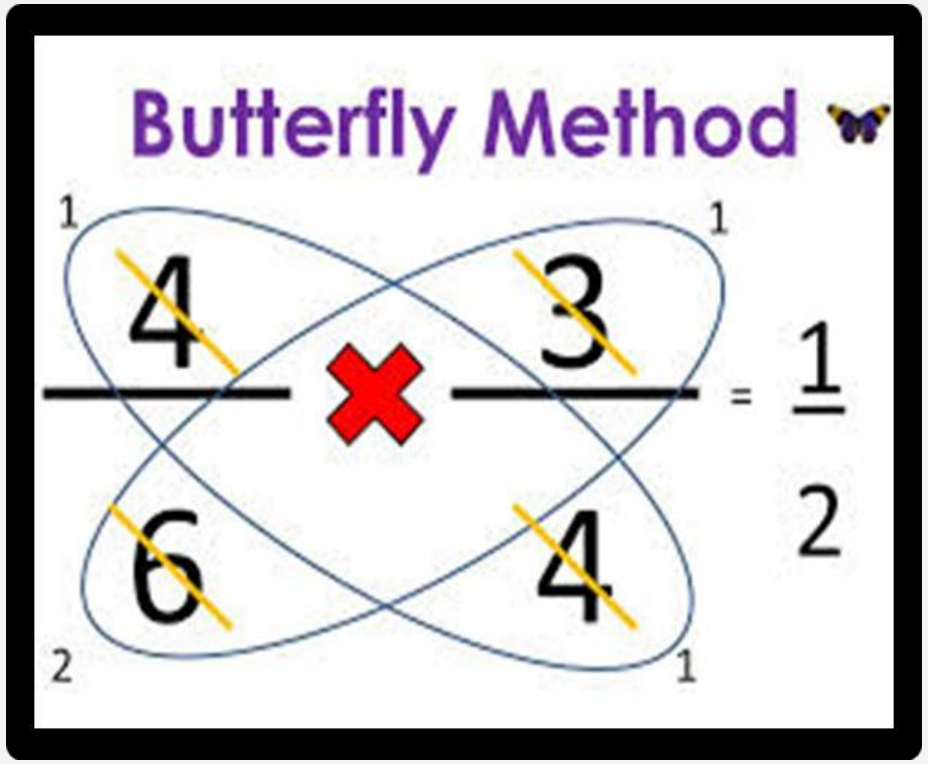


DON'T FORGET ABOUT THE 9 TRICK(S)



THE BUTTERFLY METHOD??





IS THIS WHAT WE'RE GOING FOR?

Butterfly Method

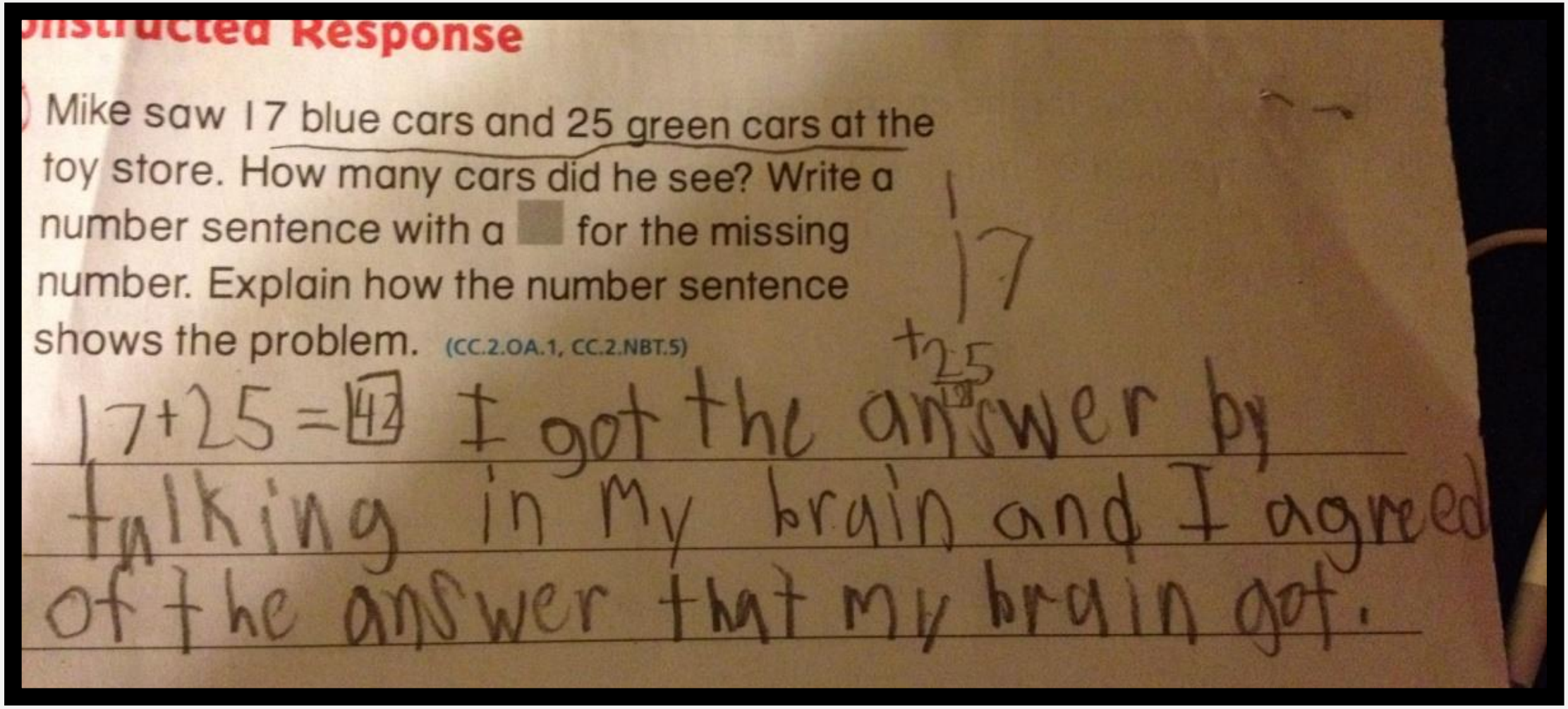
WHAT MESSAGES ARE WE SENDING?

When students share a correct answer do we validate and immediately move on?

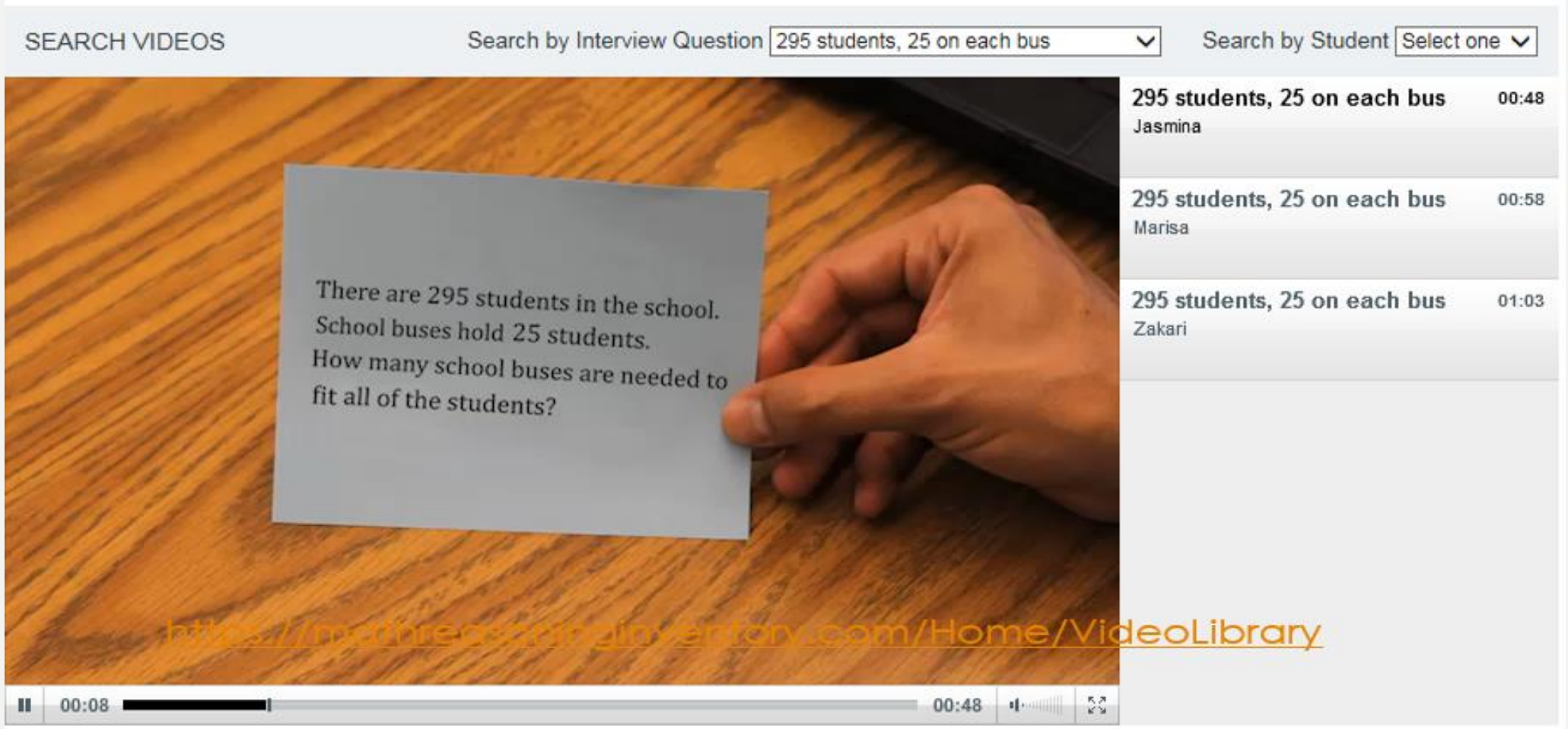
Do we set the expectation that students will explain their reasoning and defend their solutions?

Do we teach for conceptual understanding using concrete objects and models, or do we defer to tricks and shortcuts?

DO WE WANT ANSWER GETTERS OR THINKERS? UNDERSTANDING REQUIRES THINKING!! LACK OF THINKING = LACK OF UNDERSTANDING.

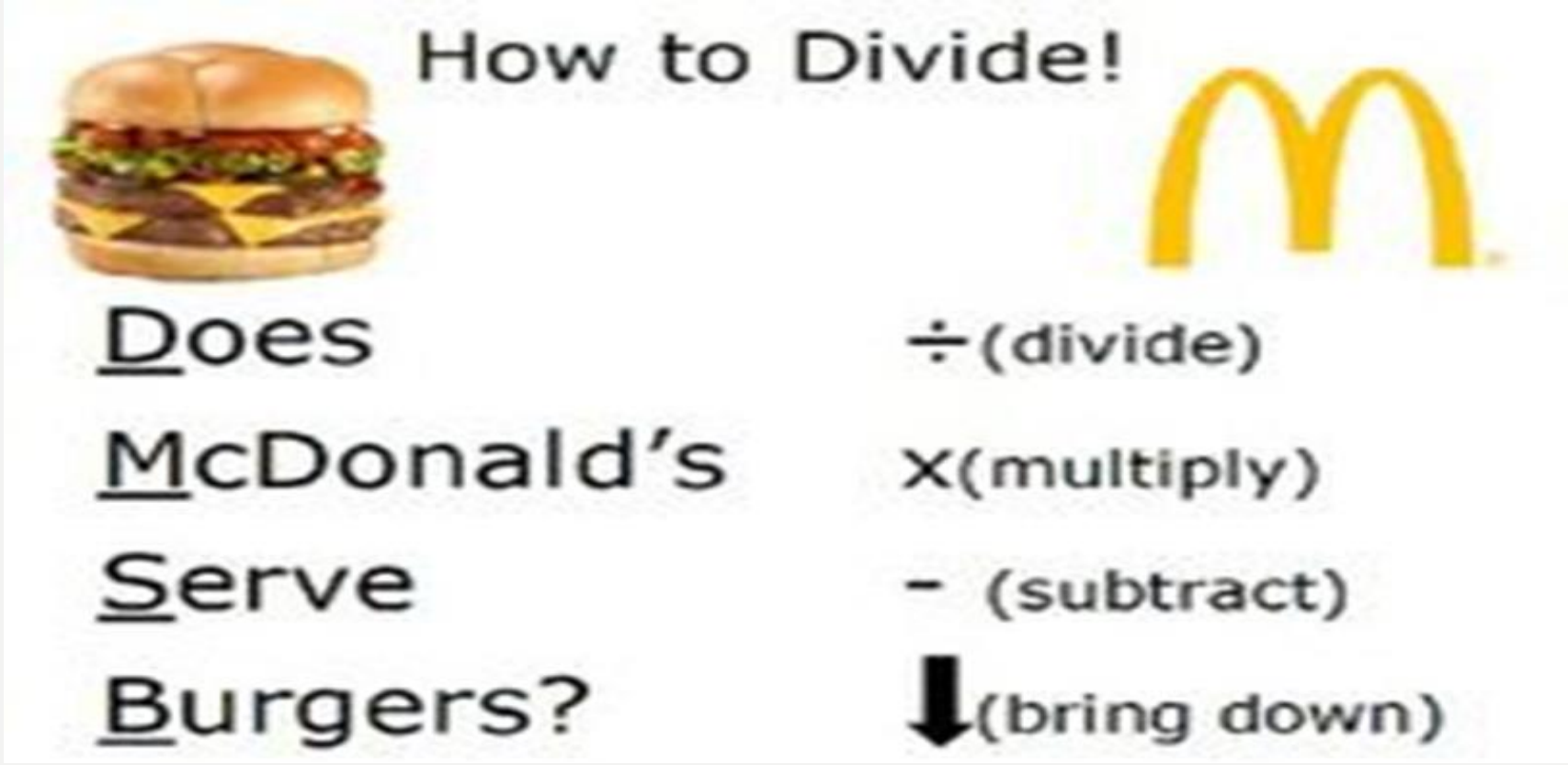


SIGNAL WORDS (UNDERCOVER TRICKS)

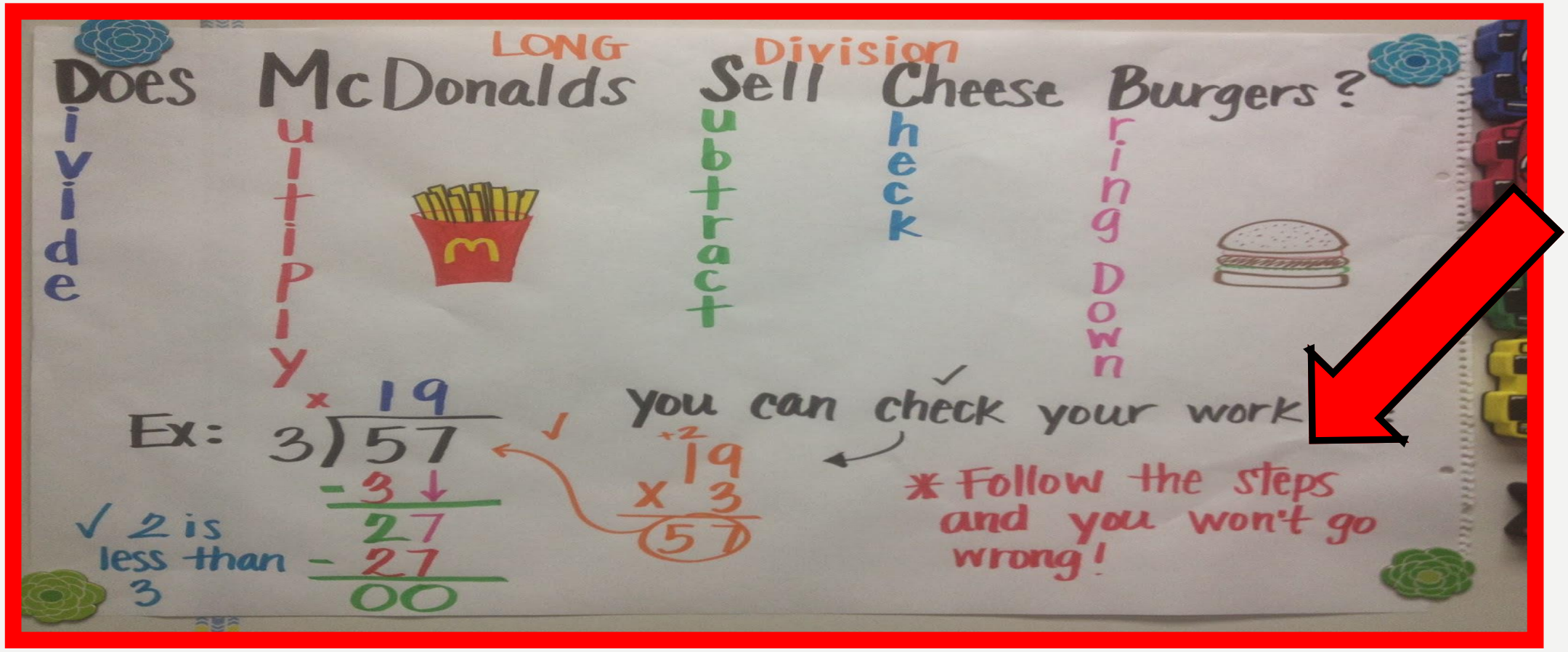


https://mathreasoninginventory.com/Home/VideoLibrary

A WELL-KNOWN CLASSIC……..



LOOK AT ALL OF THIS EFFORT! WHAT HAPPENS WHEN STUDENTS FORGET THE 'STEPS'??



FEELING LIKE THERE ARE LOTS OF 'STEPS' TO REMEMBER OR LOTS OF WORDS AND NAMES FOR METHODS?

That's because when we use tricks, there is WAY more to remember. Consider how special education students are often given tricks to 'help' them….aren't they often students who struggle with memory issues?
Wouldn't helping students make sense of math be more effective than tricks that will be forgotten??

FIX: USE TOOLS INSTEAD OF TRICKS

When we use tricks, we ROB students of the ability to make sense and make connections.

TOOLS HELP STUDENTS TO MAKE SENSE OF MATH.

THE USUAL SUSPECTS….AND THE TOOLS TO FOIL THEIR TRICKS!

- Rounding…ditch those riddles for THE BEADED NUMBER LINE!
- Adding zeros….think about that for a minute and then grab your PLACE VALUE SLIDER!!
- 'Borrowing', 'Carrying'….what????.....um…it's place value and we have DIGI BLOCKS AND BASE TEN BLOCKS AND MONEY….OH MY!
- Cheeseburgers? How about precise place value language and visual models.
- The 'nine' trick(s)? How about decomposing and equal groups?
- Butterfly method…..is this science or math? WHY BUTTERFLY WHEN YOU CAN USE PAPER FOLDING, TOWERS, CIRCLES, PATTERN BLOCKS, NUMBER LINES


LET'S GET STARTED!

BYE-BYE BUTTERFLY!!!

BIG IDEA #1: VISUALS ARE ESSENTIAL

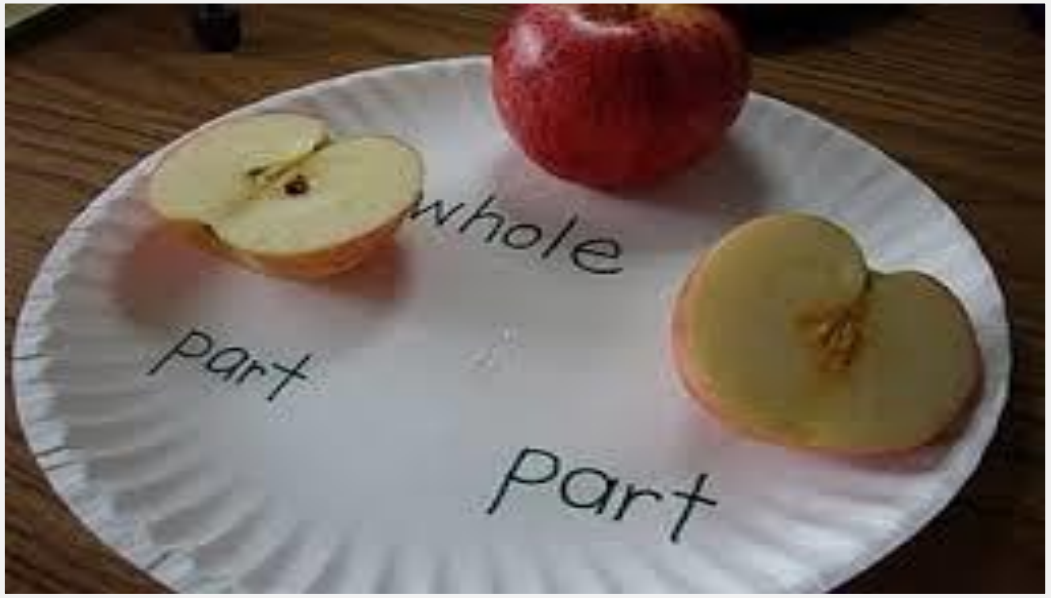
Begin with CONCRETE move to PICTORIAL

- ***Way more than pizzas and pies!!***

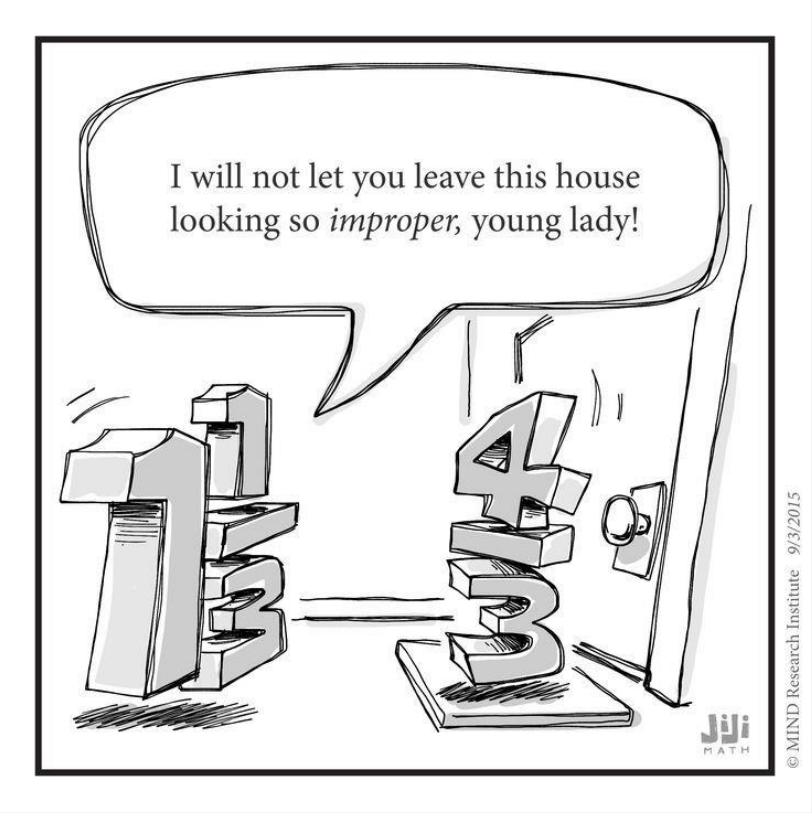
- **CONCRETE: Pattern blocks, fraction squares, fraction bars, fraction circles, fraction towers, Cuisenaire rods, paper folding**
- **PICTORIAL: Bar models…tape diagrams…number lines…double number lines**

BIG IDEA #2: MATH IS ABOUT CONNECTIONS

Think about PARTS and WHOLES

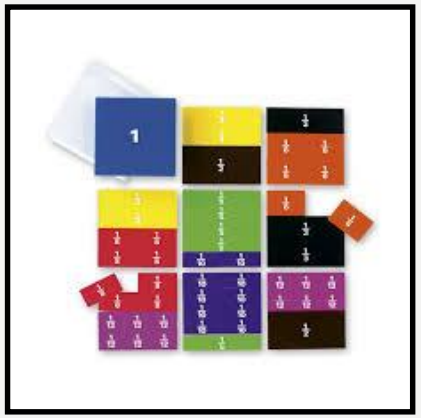


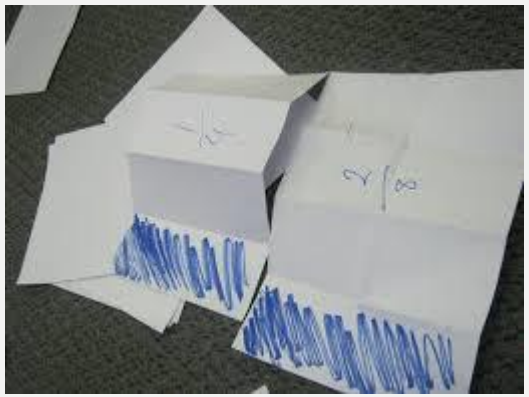
BIG IDEA #3: LANGUAGE IS A CRITICAL PIECE OF SENSE MAKING



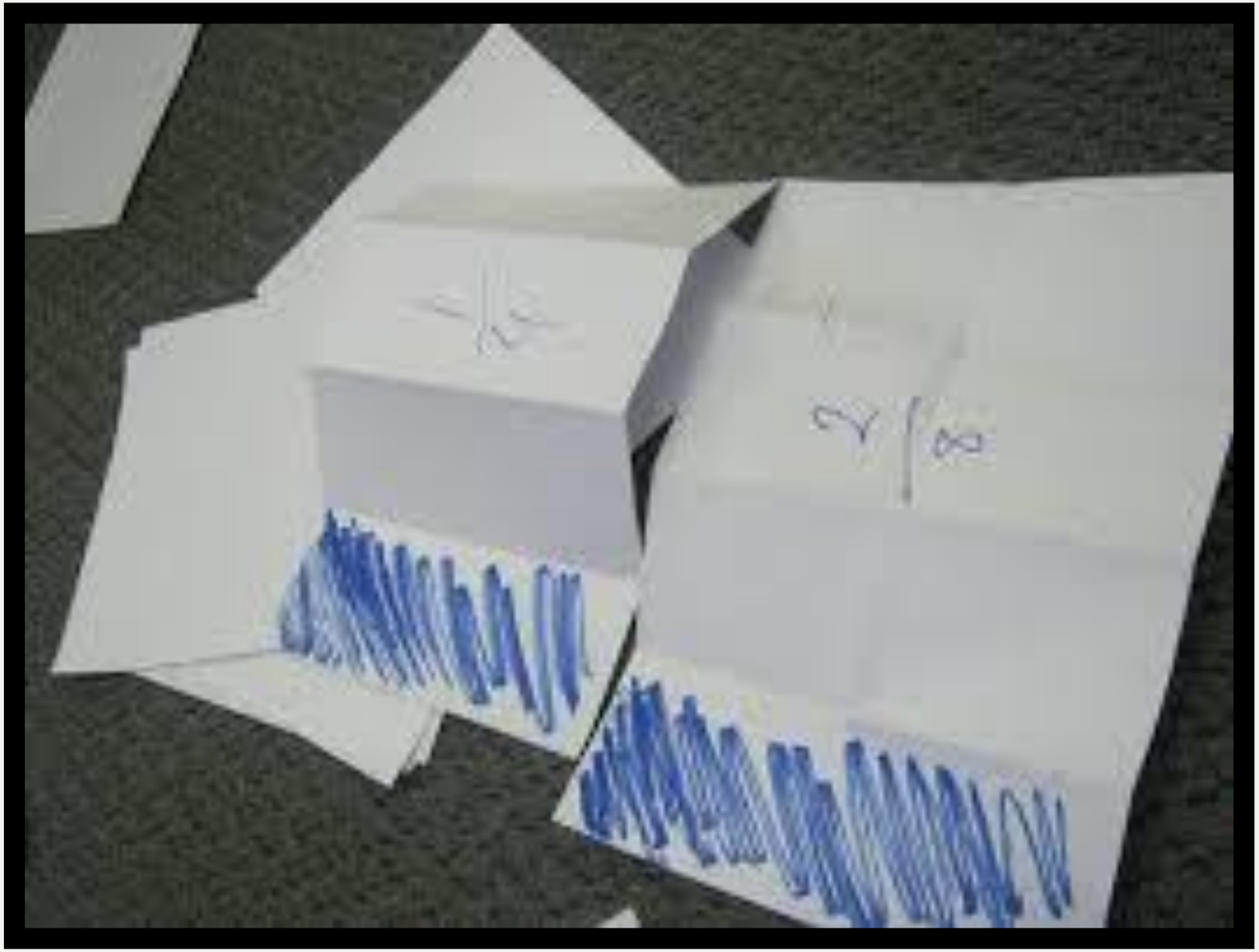
LET'S THINK ABOUT FRACTIONS. LOTS OF RULES AND TRICKS… WHERE'S THE UNDERSTANDING??

EXPLORE THE TOOLS…….





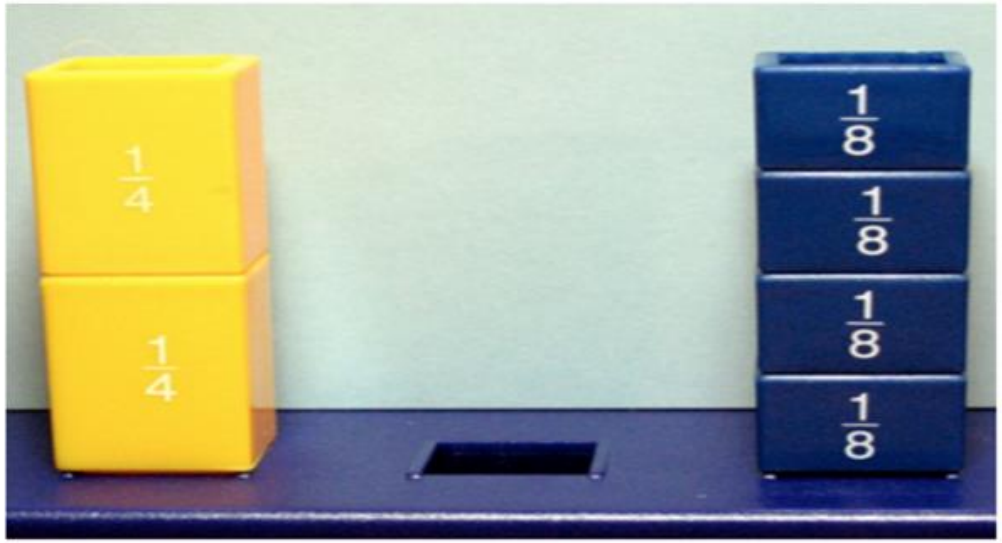
How can these replace tricks and build understanding for students??



WAYYYY BETTER THAN MEMORIZING STEPS

Equivalent Fractions

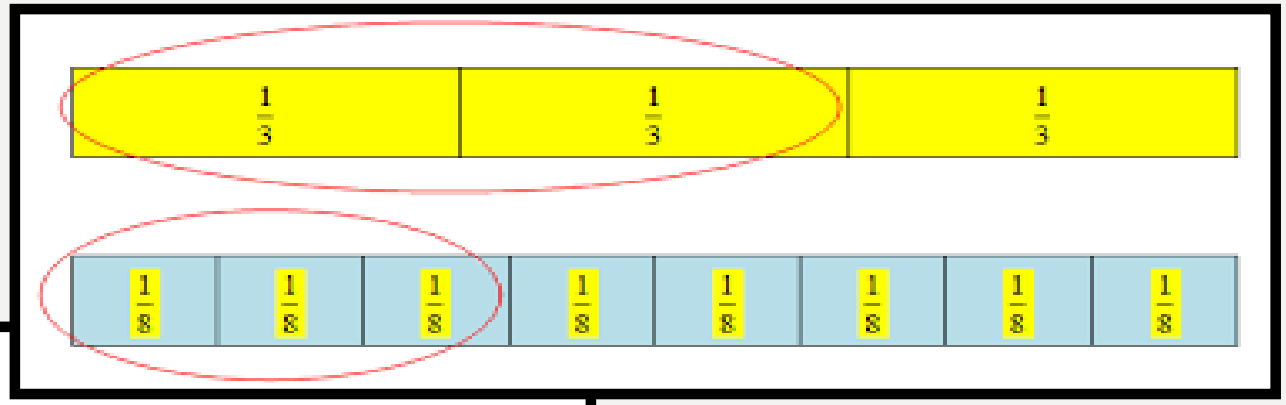
Can you find one Fraction Tower piece that is the same height as the towers for $\frac{2}{4}$ and $\frac{4}{8}$?



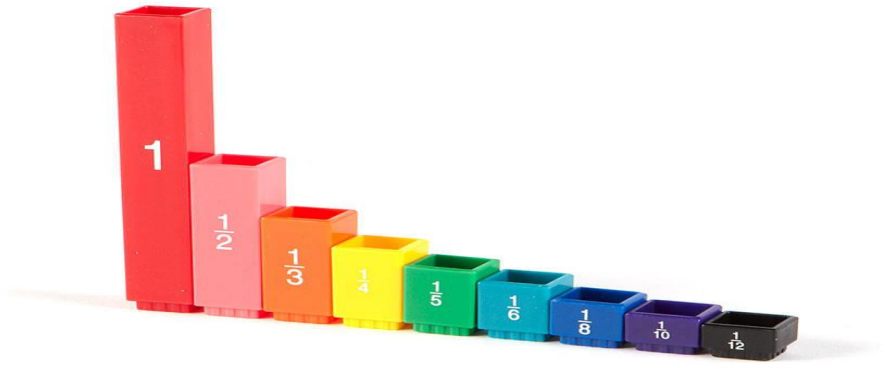
JEJMath, Ltd.

ETA hand2mind
hands-on learning for growing minds

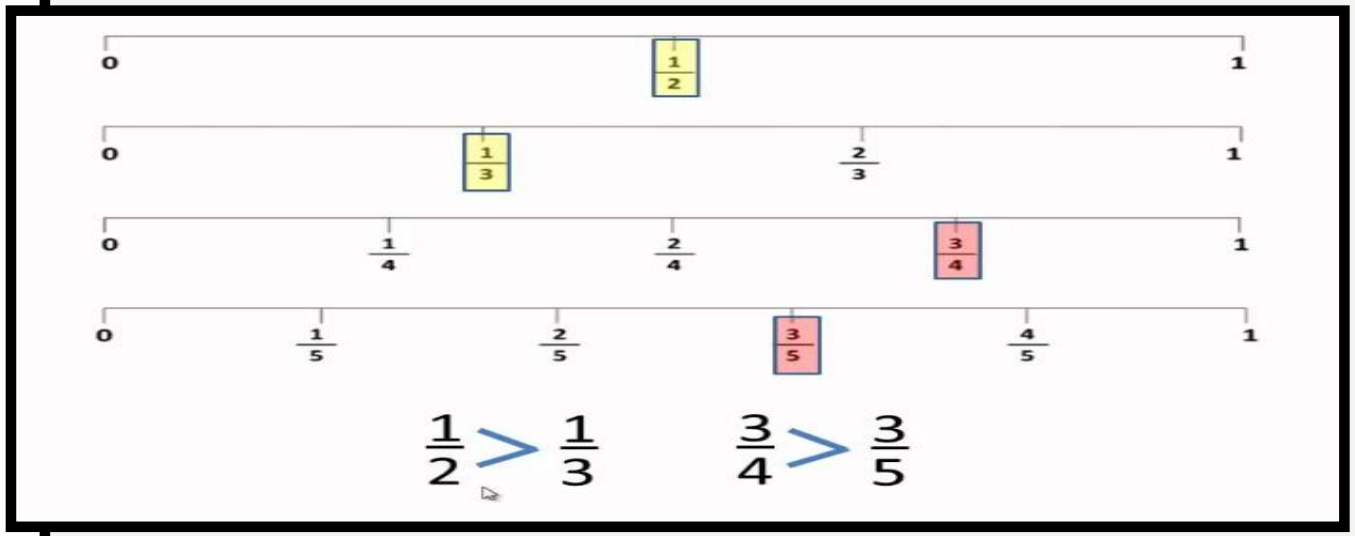
COMPARING WITH MEANING… NO BUTTERFLIES ANYWHERE!



PICTORIAL



CONCRETE



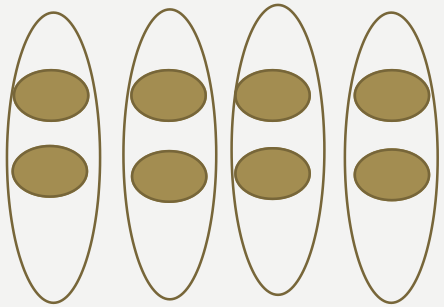
ABSTRACT


This is a masterpiece… with ‘steps’ to remember
But what does it teach students about how fractions work?
DIVIDING
KEEP
CHANGE
CHANGE
The sign
to a X
KFC
FRACTIONS

LET'S REVISIT THIS WITH A VISUAL MODEL

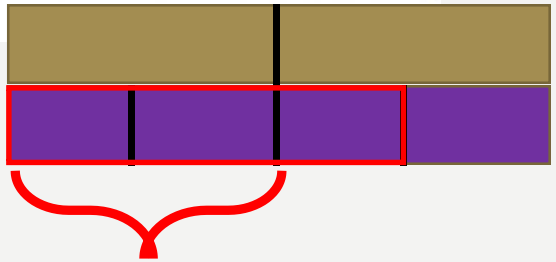
Connect to prior knowledge… how many 2's are there in 8?

$8 \div 2$



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

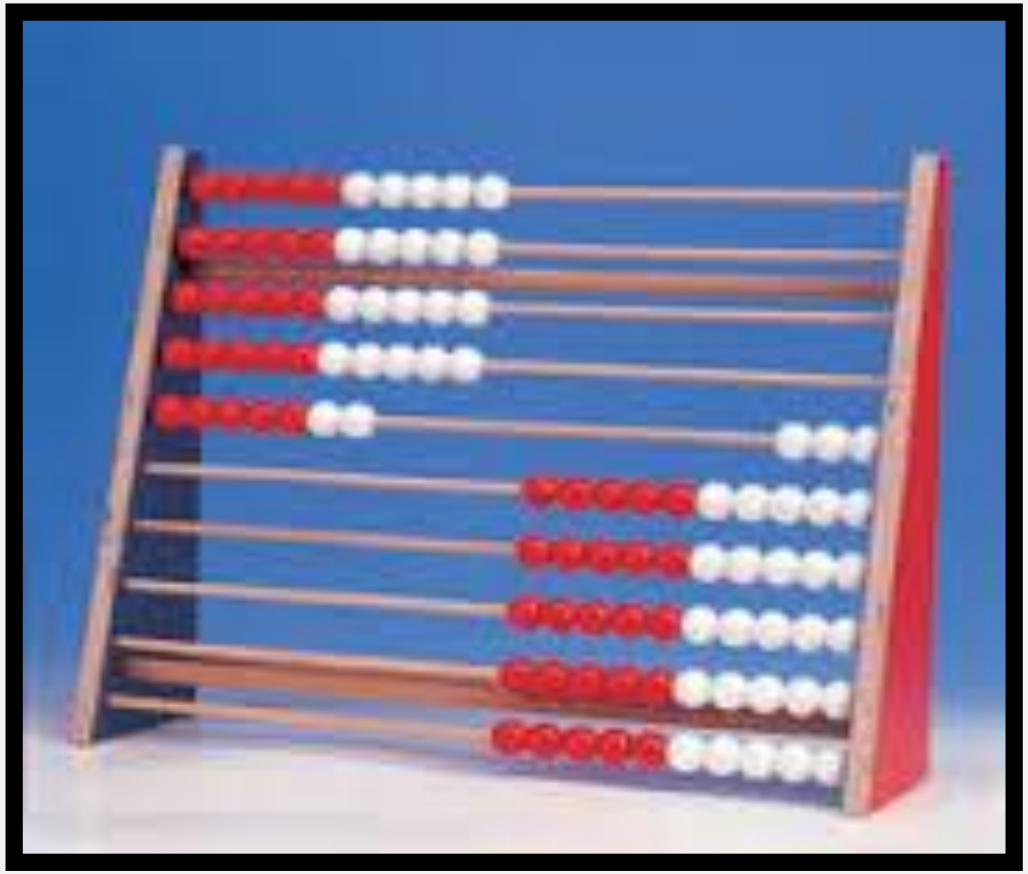
THIINK… how many ¾ ths are in ½ ?

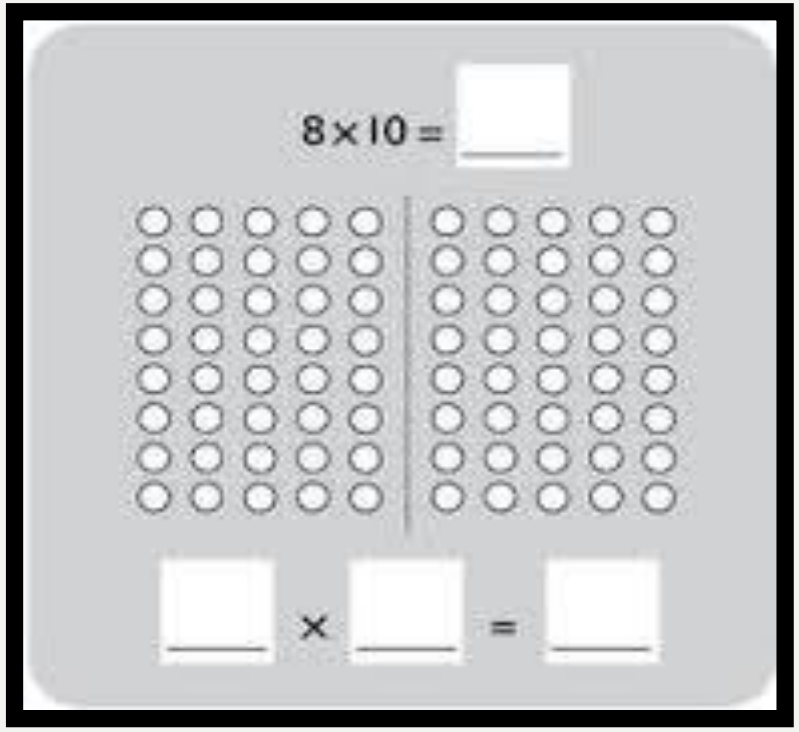


EVEN BETTER WITH CONTEXT!

WHAT ELSE SHOULD WE PUT IN OUR TOOLBOXES?

DITCH THAT 9 TRICK FOR THE REKENREK AND STRATEGIES!





Use 10's

DON'T HAVE REKENREKS??MAKE THEM!

THE BEADED NUMBER LINE…A VERSATILE TOOL FOR MULTIPLE OPERATIONS

Dr. Nicki

4:45

NOW YOU TRY IT!!

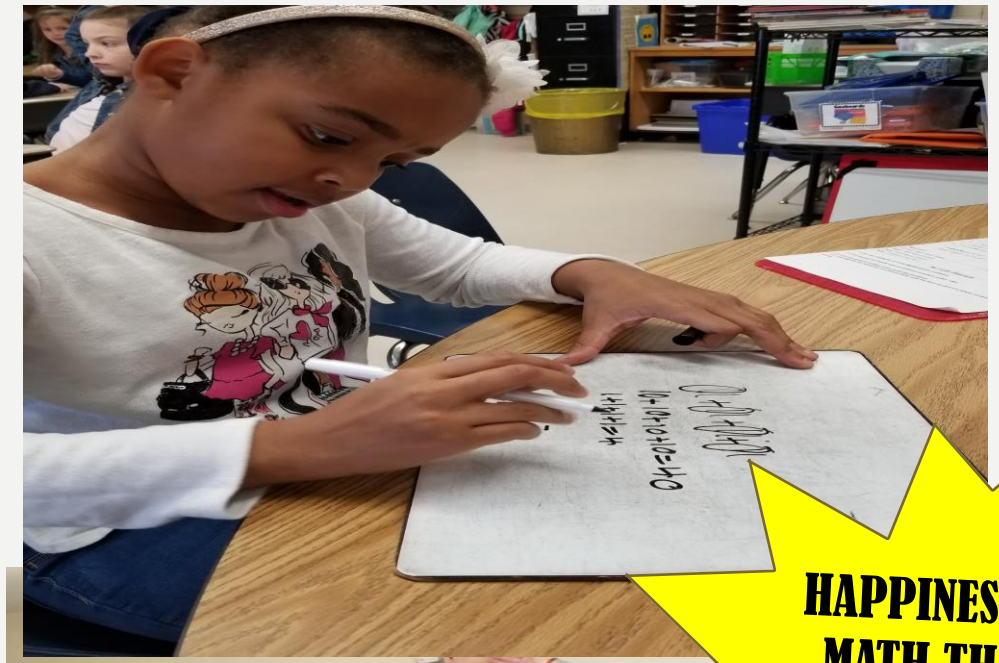
WHY DOES IT MATTER???

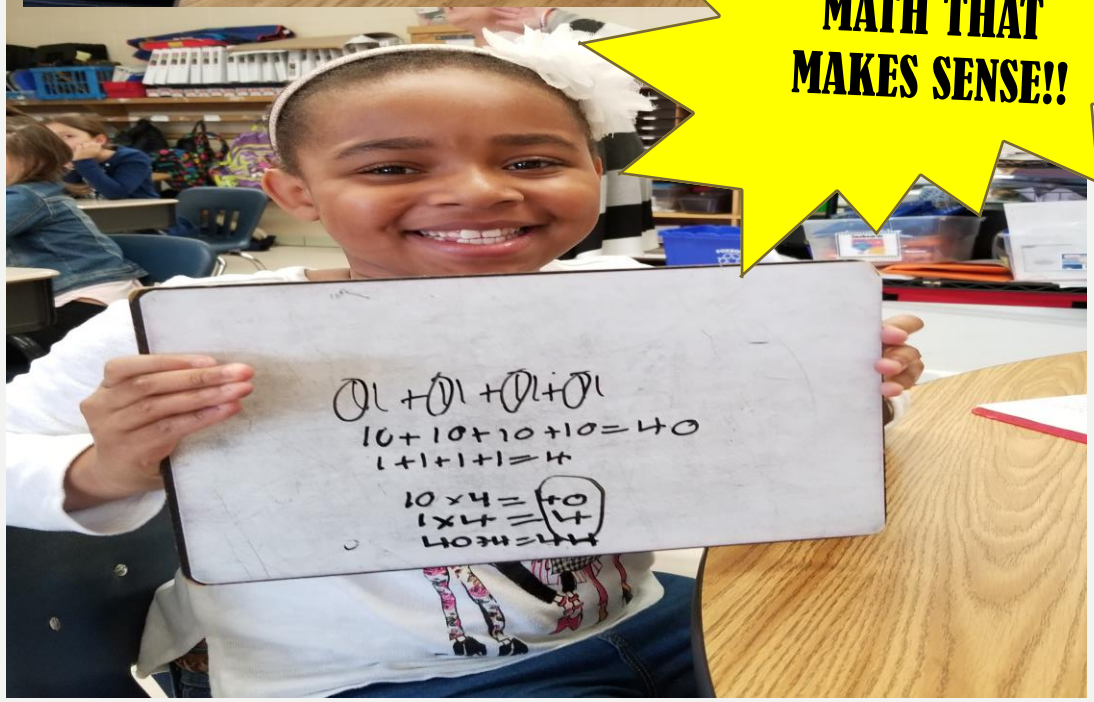
Answer or Understanding? What is important.

Students must attain CONCEPTUAL UNDERSTANDING and a sound comprehension of PLACE VALUE before being introduced to the Standard Algorithm (grade 5)

This is done through concrete modeling (base-ten blocks), partial products/other alternative algorithms, and

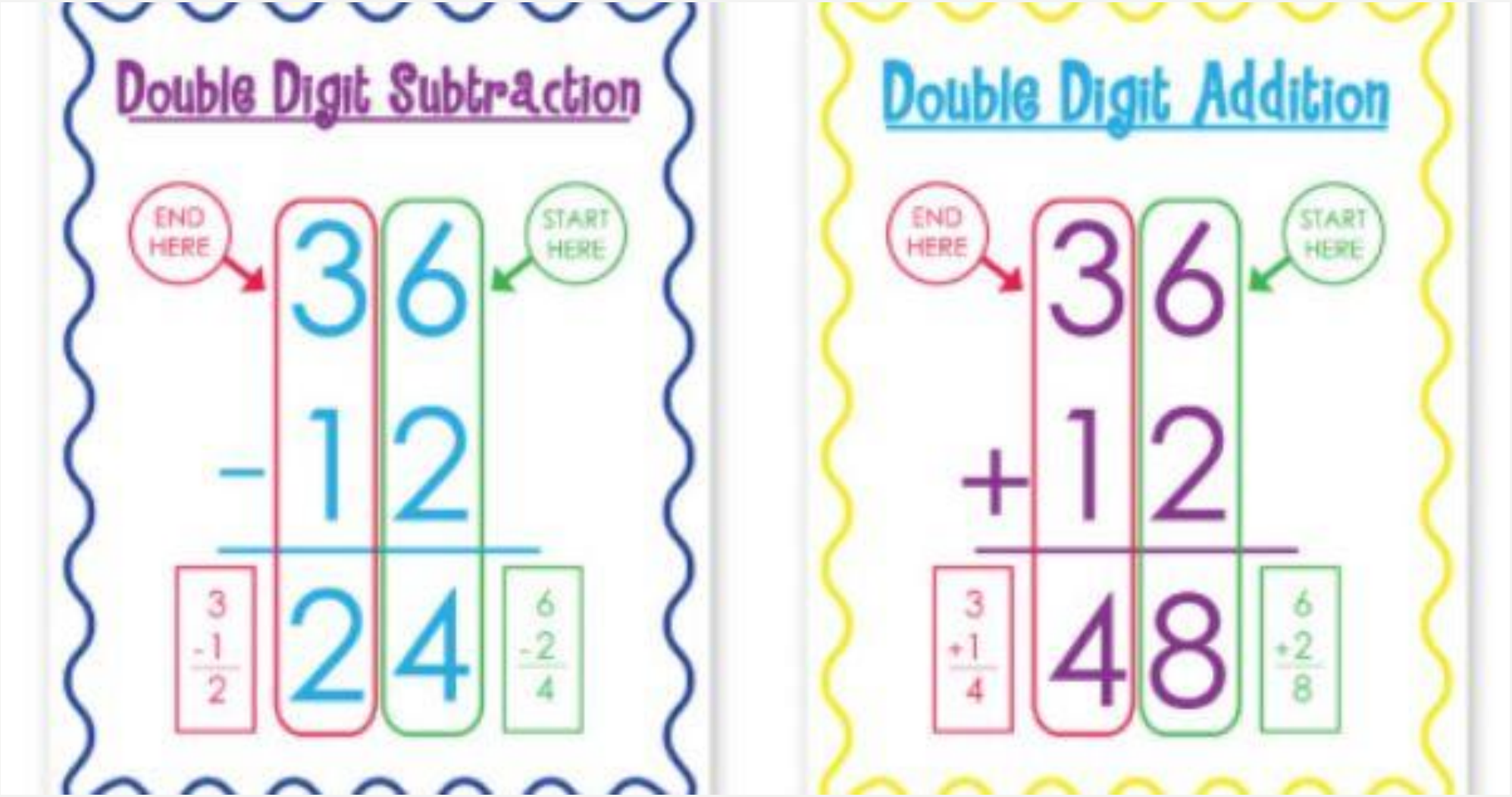
explicit place value language





HAPPINESS IS MATH THAT MAKES SENSE!!

WHAT'S WRONG WITH THIS PICTURE?



FIX:
USE PLACE VALUE REPRESENTATIONS AND PRECISE LANGUAGE TO EXPLAIN OPERATIONS

There are 3 different 7's in the problem. Do they are represent the same amounts?

Carrying? Borrowing? Um…NO

$$\begin{array}{r} 737 \\ -\ 479 \\ \hline \end{array}$$

LANGUAGE/ACADEMIC VOCABULARY

(ATTEND TO PRECISION!!!)

DIGIT vs NUMBER

1	5	3	153	▦▦▦…
digit	digit	digit	numeral	number
d	o	g	dog	
letter	letter	letter	word	idea

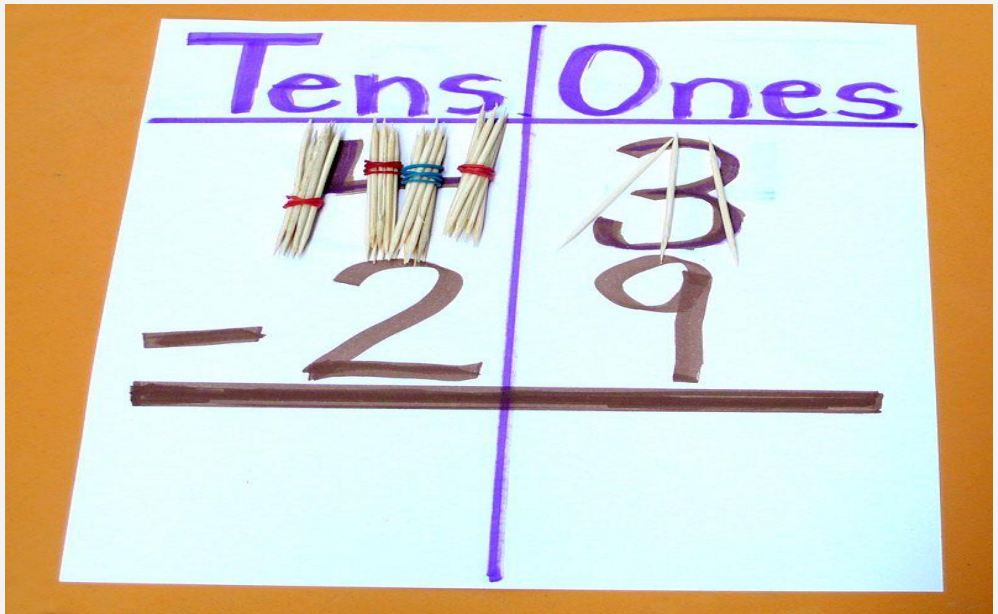
FAIR TRADE

DECOMPOSE

REGROUP

BORROW

CARRY



FIX:
PROMOTE UNDERSTANDING BY BUILDING UNDERSTANDING OF PLACE VALUE USING VISUALS

Conceptual Long Division

HOW ABOUT ADDING ZEROES???

LIES MY TEACHER TOLD ME

To multiply by 10, just add zero to the number

Wait…What??

.8 x 10 = 8

6.25 x 10 = 62.5

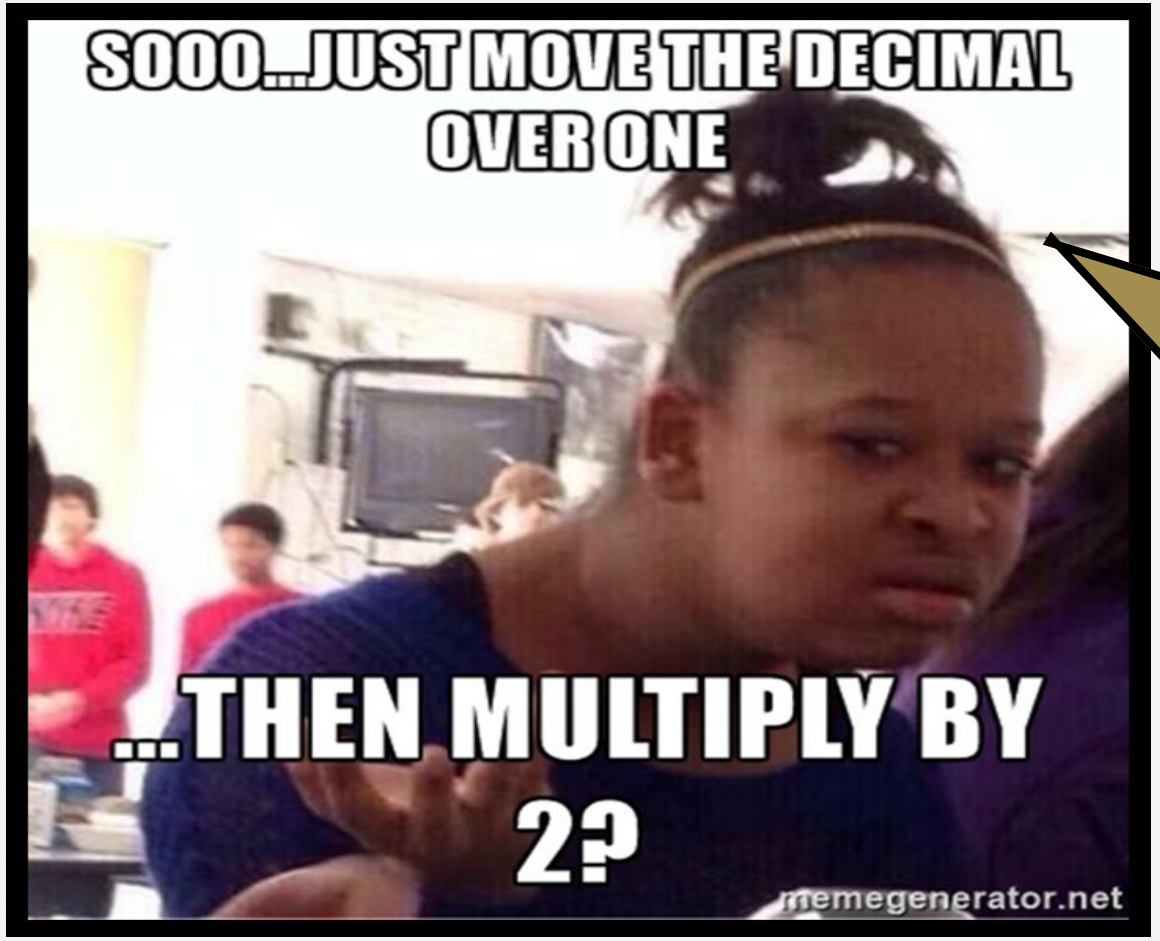
Multiplication makes values larger

Wait…What??

20 x .5 = 10

½ x ½ = ¼

AND MY PERSONAL FAVORITE….

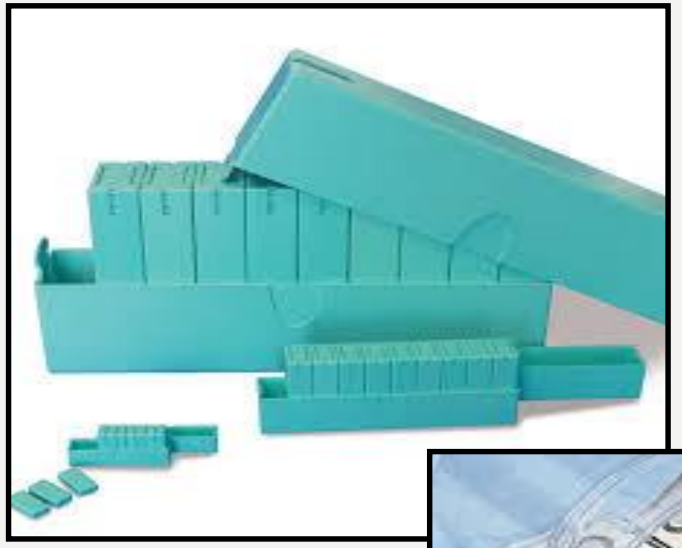


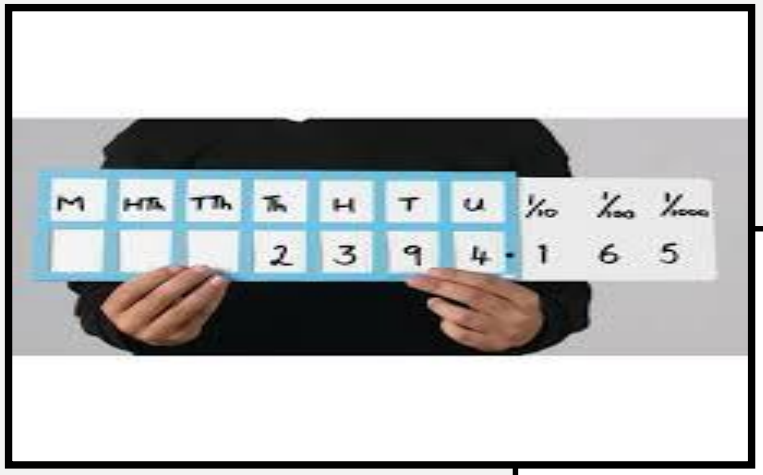
Raise your hand if you can describe a real life example where you moved a decimal point.

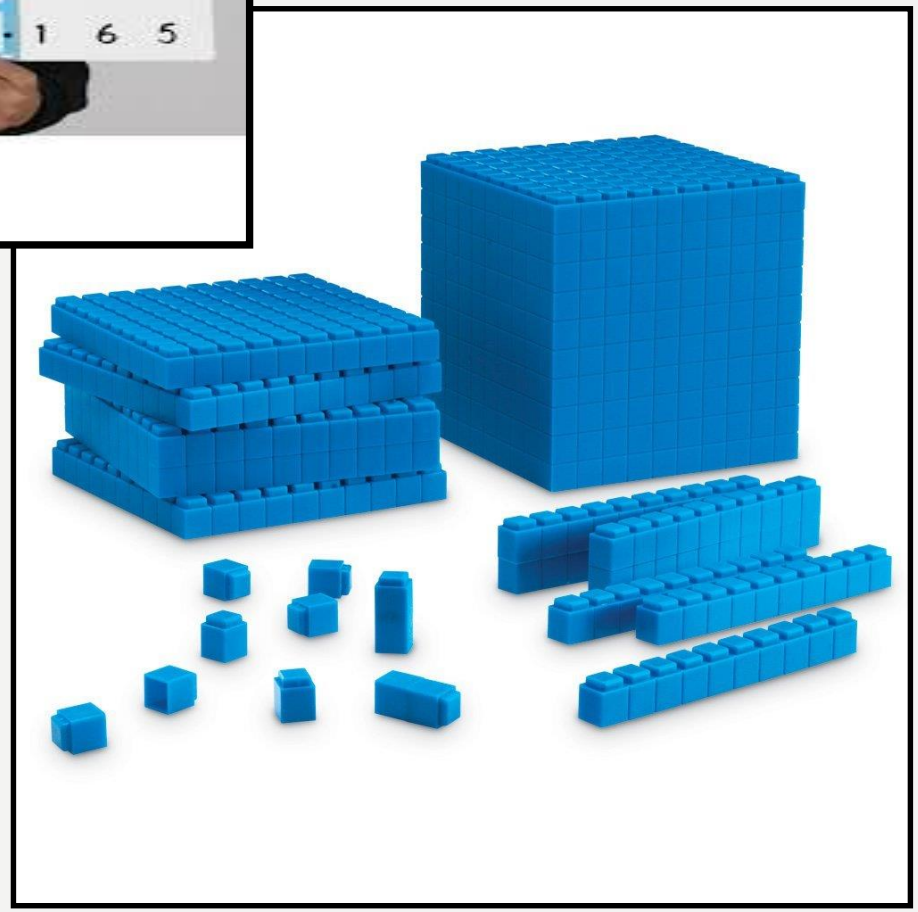
Do decimal points move?

PLACE VALUE….THE TOOLS TO FIX THE TRICKS!

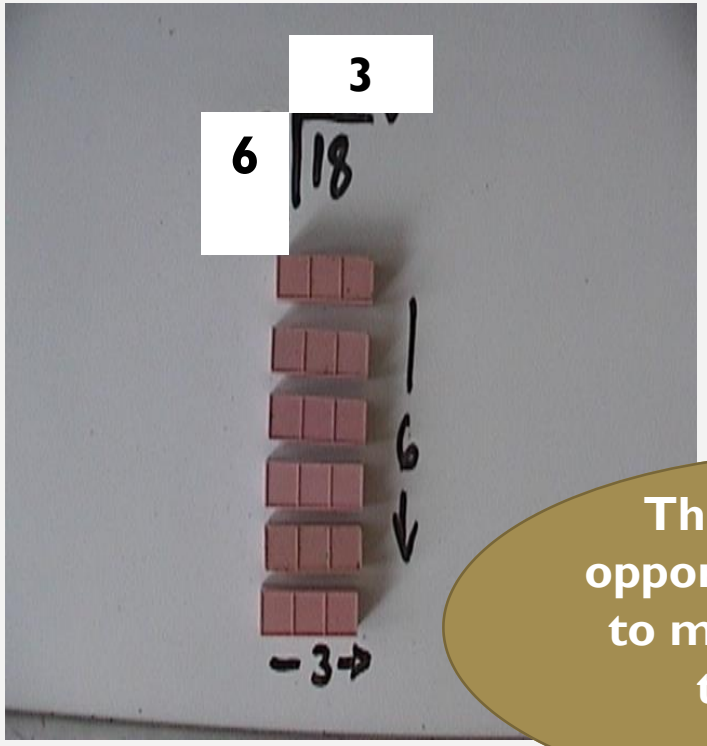
PV Slider

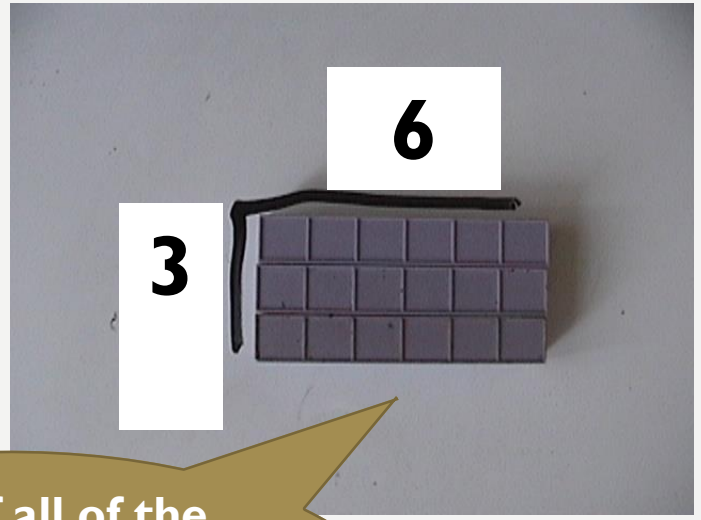




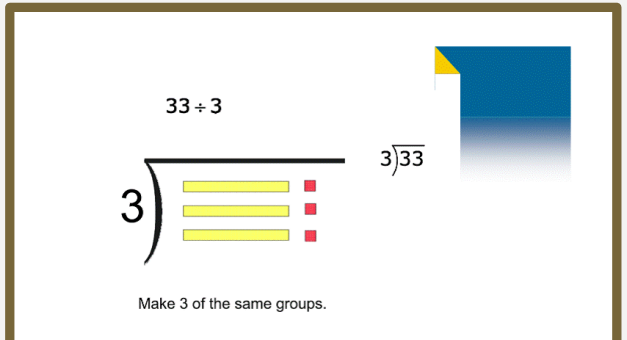


IN EARLIER GRADES, DEVELOP THE CONCEPT OF DIVISION AS EQUAL GROUPS…KEEPING IT CONCRETE:





Think of all of the opportunities you have to make connections to AREA and dimensions!



IT MIGHT BE A TRICK IF IT…

- Is not grounded in mathematical meaning
- Has no real reason WHY it works
- Has steps that must be followed
- Cannot be explained by you or the students
- Lacks any connection to other math ideas
- Is wrapped in a cute riddle or mnemonic

SOOOOOOOOOO…..WHAT WILL YOU TRY?

AND REMEMBER……

Teaching TRICKS gives students the idea that all we are interested in is the **ANSWER**.

Our goal is to produce **THINKERS, not answer getters.**

FIX THE TRICKS AND UPGRADE THE RESULTS OF YOUR INSTRUCTION FROM TEFLON….TO…. VELCRO

QUESTIONS?

Contact Me

alisonmellomathpd@gmail.com

Follow me on Twitter

alisonmellomath

DrMelloAsstSup