KCM

KENTUCKY CENTER FOR MATHEMATICS

Constructing Number Sense

Fluency with Multi-digit Multiplication and Division

Welcome!

Your host:

Belle Rush

Regional Consultant
Kentucky Center for Mathematics
bsrush180@yahoo.com

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Kentucky Center for Mathematics

- KCM seeks to advance the knowledge and practice of effective mathematics teaching and learning, encompassing early childhood through adult education.
- KCM provides and develops statewide leadership, facilitate professional learning experiences, and cultivate innovation with the aim of improving mathematics education, practice and policy.

KCM Yearly Numbers

29 math courses taught

73 cohorts of teachers

Over 1000 KY teachers attending

Over 182 days of math professional learning

Over $150,000 of math materials directly in the hands of teachers

109 school districts

300 KY schools

100 principals trained

>5000 students impacted

KCM Annual Math Conference national prominence

Closing the achievement gap for our KY math students.

Math Achievement Fund intervention students (3000) had an average of 10 percentile points gained as a direct result of KCM trained math interventionists.

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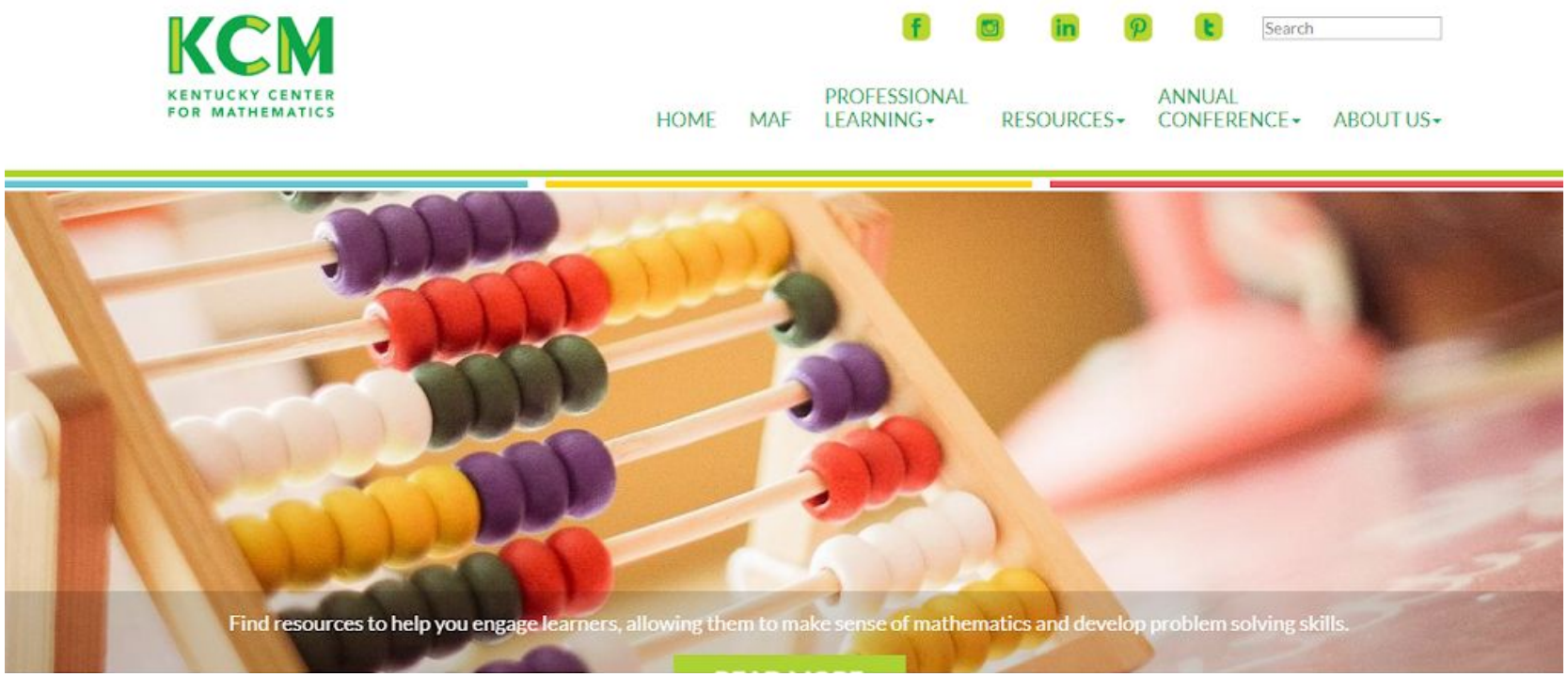
Visit Our Website

www.kentuckymathematics.org



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Agenda

- What the research and standards say
- A quick look at strategies
  - Arrays and area models
  - Partial products
  - Properties of operations, especially the distributive property
- Games
  - Build It, Draw It, Prove It
  - Multi-Digit Multiplication Math Story Matching
  - Nice and Easy
- Links to manipulatives, games, and explanations of strategies

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What the research says…..

Multiplication moves from the first year (in Grade 4) where the approach of the standard algorithm is developed and explained using visual models (diagrams) to the second year (in Grade 5) where the approach of the standard algorithm continues to be deepened and then is used fluently.

The major issue for multi-digit multiplication is what to multiply by what and how the place values of the digits in the factors affect the place values of the partial products. An array or area model can help students understand these issues in terms of how the partial products are recorded.

NCSM JOURNAL • FALL/WINTER 2012-2013

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Critical areas for 4th grade

In the Number and Operations in Base Ten domain, students will:

apply their understanding of models for multiplication (equal-sized groups, arrays, area models), place value and properties of operations, in particular the distributive property, as they develop, discuss and use efficient, accurate and generalizable methods to compute products of multi-digit whole numbers;

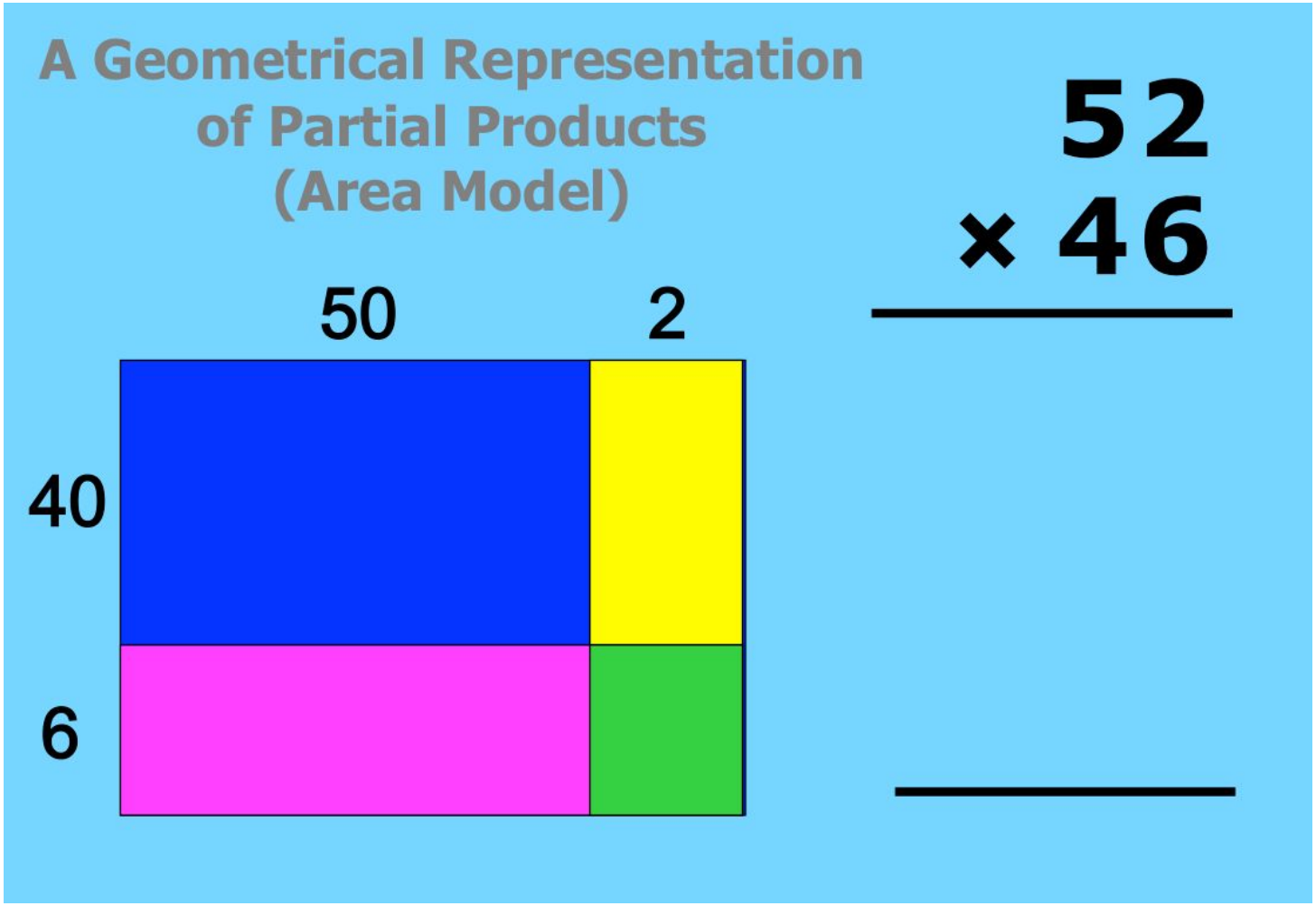
What do the standards say?

KY.4.NBT.5 Multiply whole numbers

- Up to four digit number by a one-digit number
- Two-digit number by two-digit number

Multiply using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays and/or area models. MP.3, MP.4, MP.8

Example of area model



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Multiplication strategies

Partial Products		Area Model
324	300 + 20 + 4	x 300 20 4
x 6		6 | 1,800 | 120 | 24
24	6 x 4	1,800 + 120+ 24 = 1,944
120	6 x 20	
1,800	6 x 300	
1,944		

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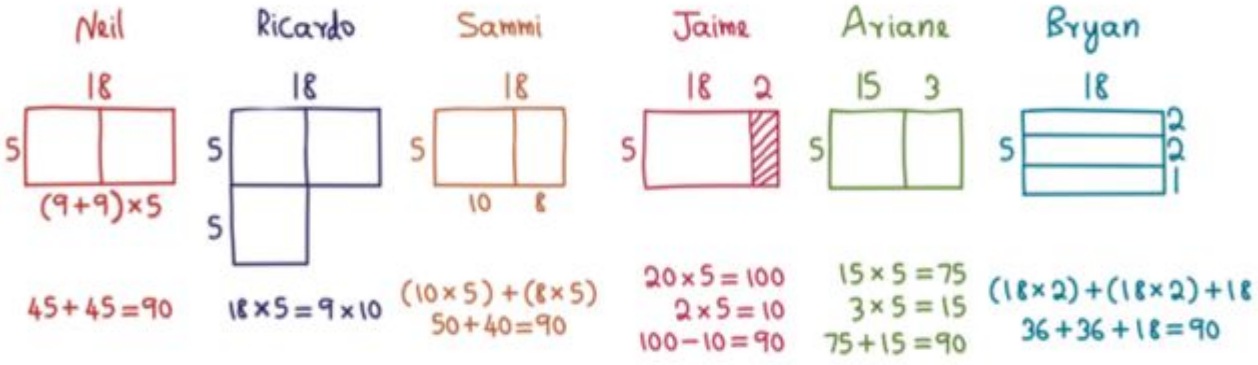
Useful explanations of strategies

https://www.youtube.com/watch?v=wxE2Kur4AHc

Work out 18 x 5 and show a visual solution.



from Jo Boaler. Mathematical Mindsets (2016)

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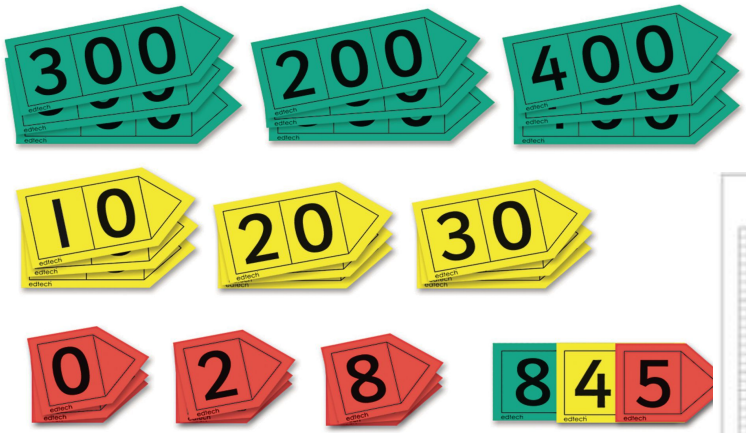
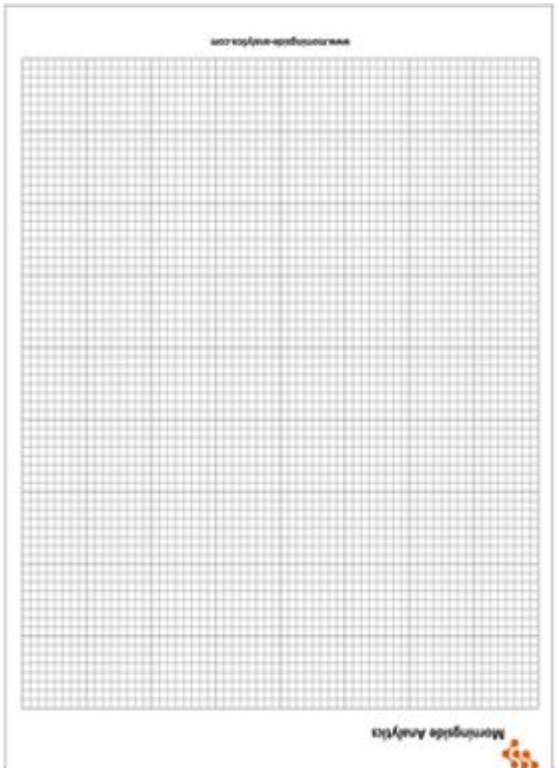
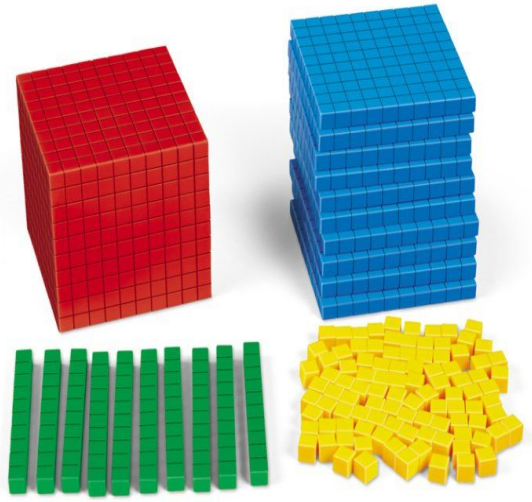
Build It, Draw It, Prove It







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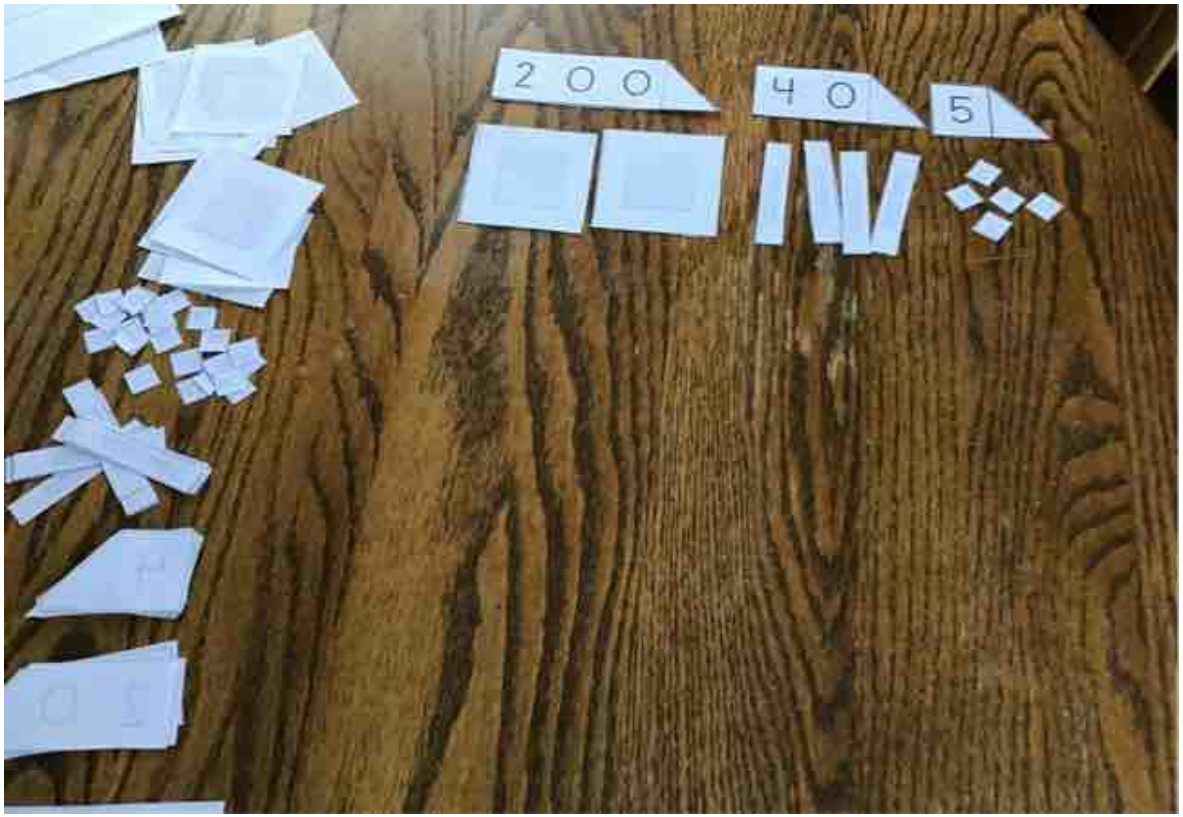
- Turn arrow cards face down.
- Turn over one from each set to create a
- 3 digit number.
- Build that number using place value pieces.



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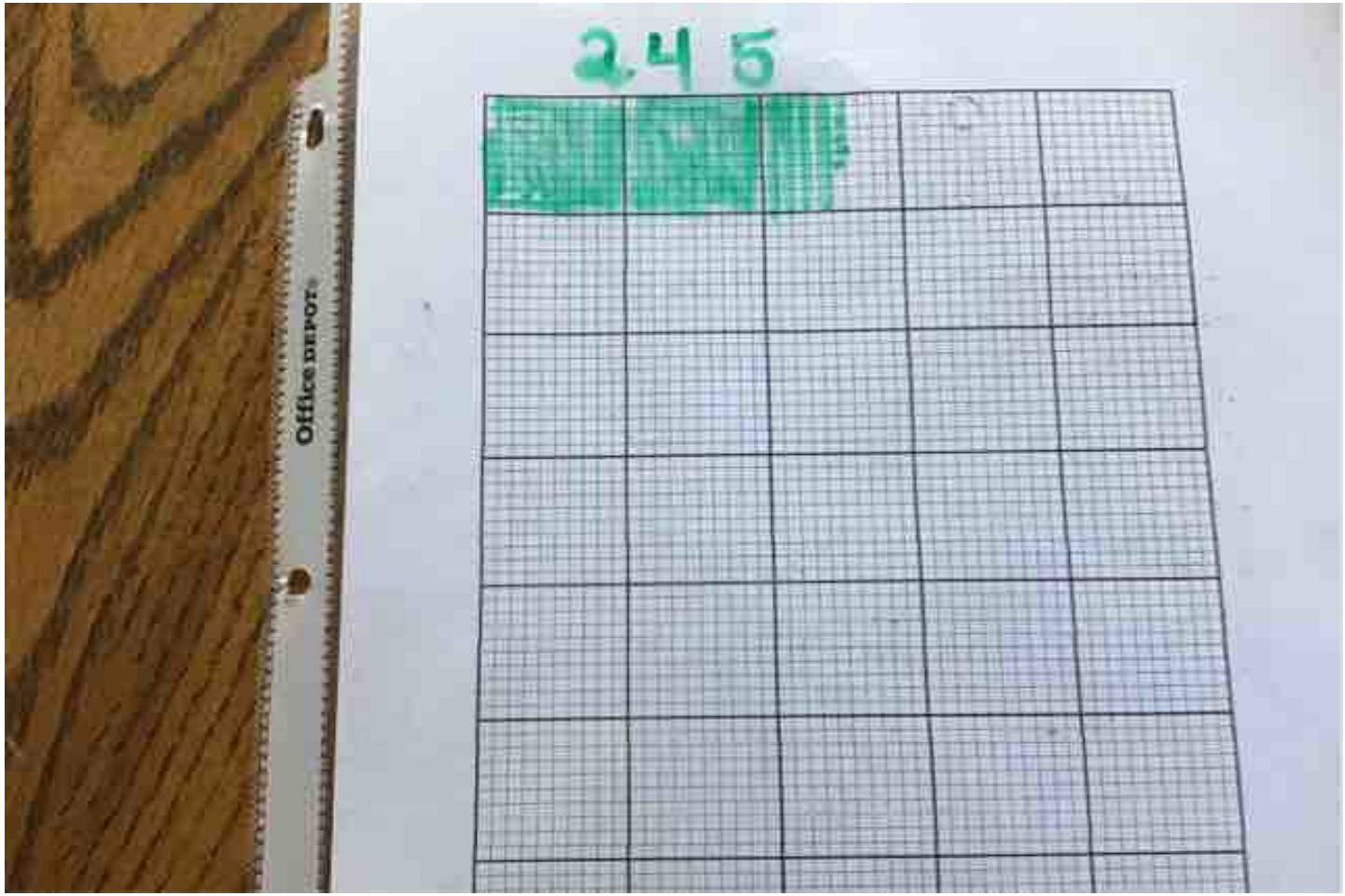
- Draw your 3 digit number on the grid paper.



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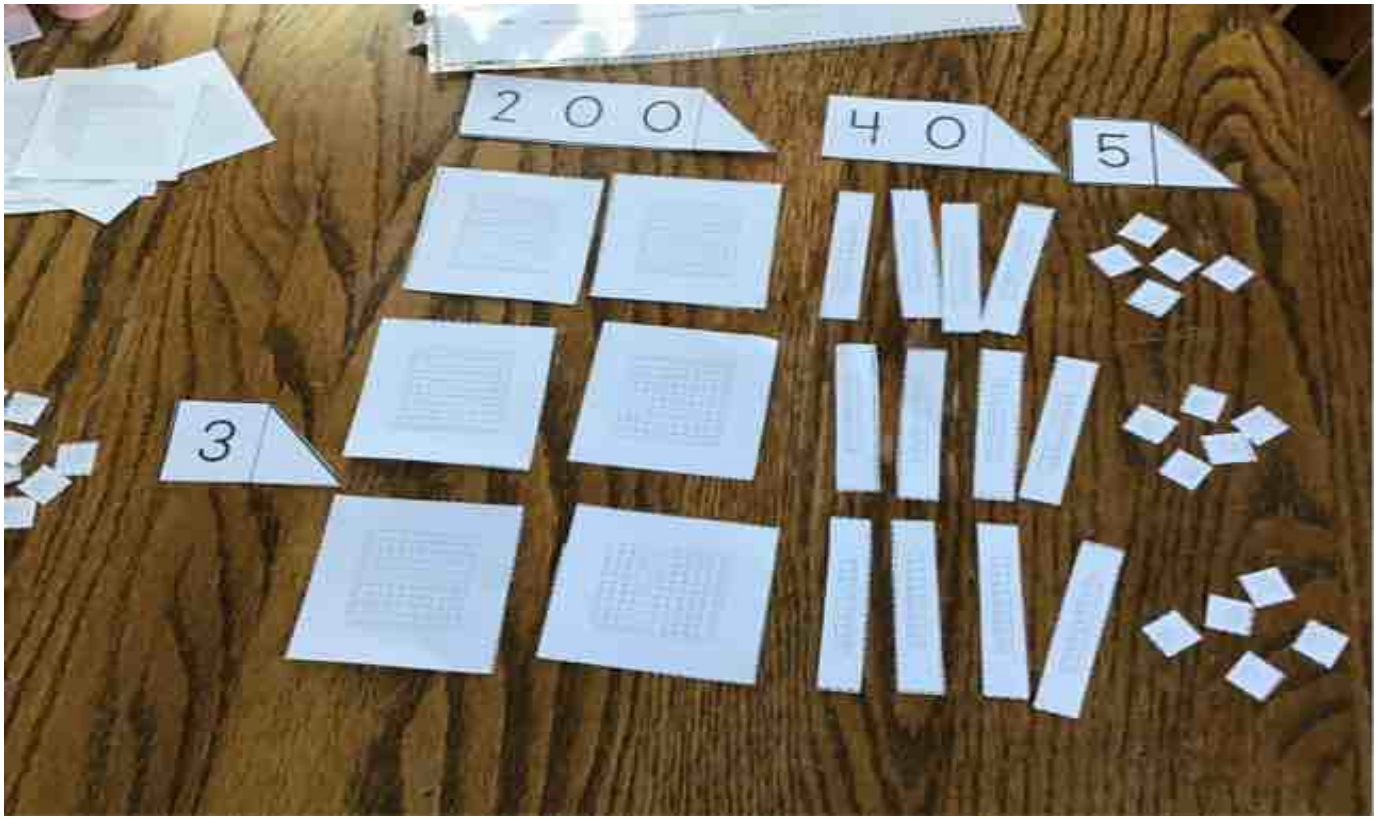
- Pick up a one digit arrow card.
- Build your original number that many times with place value pieces.



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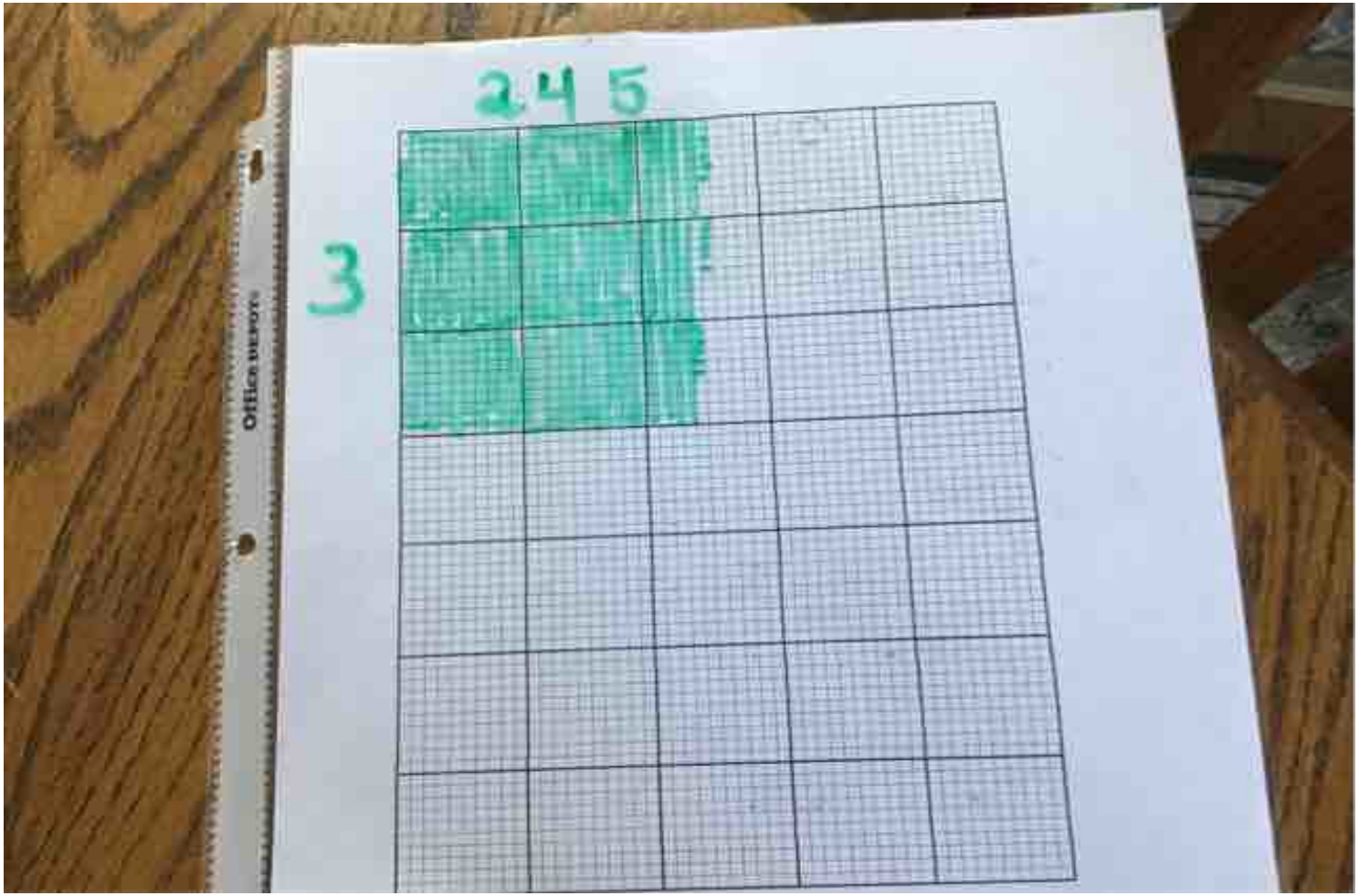
- Fill in the grid sheet, showing the total number.



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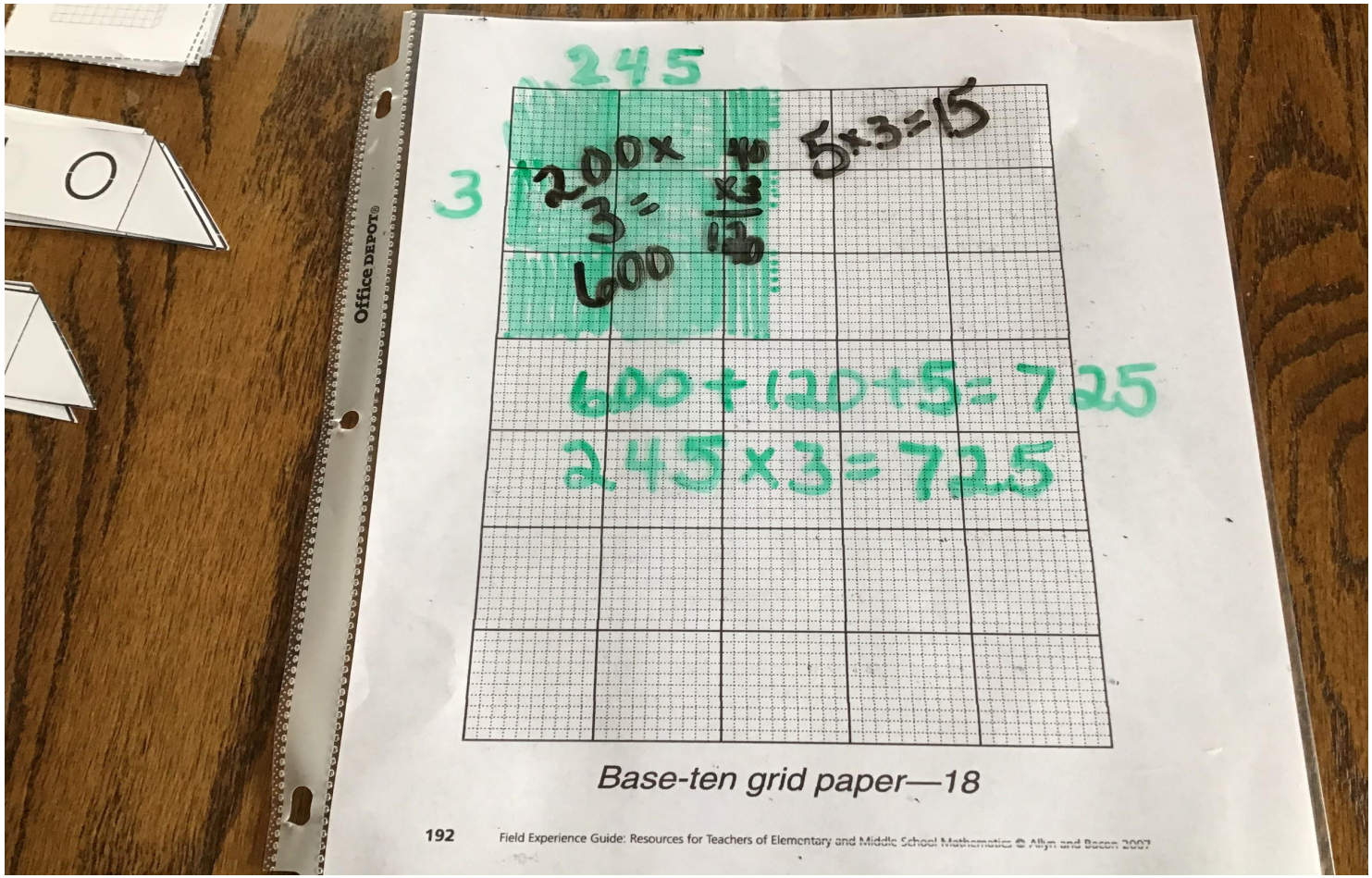
- Write your equation to show how you got your answer.



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Build it, Draw it, Prove it

To play Build it, Draw it, Prove it:

1. Partner A draws an arrow cards from the hundreds, tens and ones pile
2. Partner A builds the three digit number using the base ten blocks
3. Partner A draws the model of the three digit number on the grid paper.
4. Partner A draws another arrow card this time from only the ones pile. This card is your multiplier. Partner A now has a 3 digit number times a one digit number.
5. Partner A draws the multiplication equation on the grid paper. (245 x 3) This shows the visual model of this multiplication equation.
6. Partner A solves the equation.

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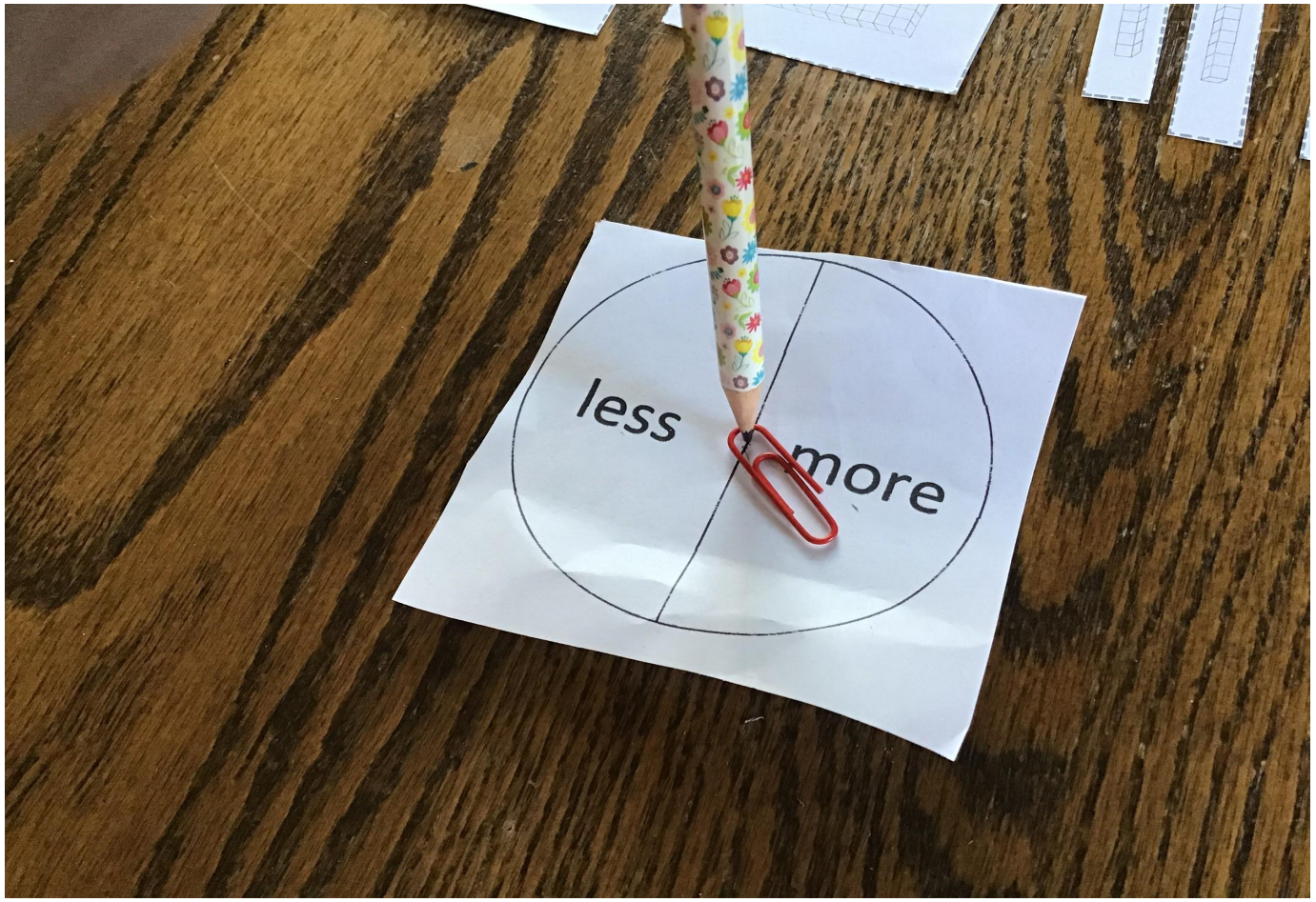
To play it with a partner

Game:

1. Partner B repeats steps 1-6
2. One partner spins the more or less spinner.
3. Winner is the partner who is either more or less based on the spinner.
4. The winning partner gets a point
5. The winner is the partner who gets 5 points first.

- If playing with a partner, after each player has had a turn, spin to see if the player with more or less gets a point.



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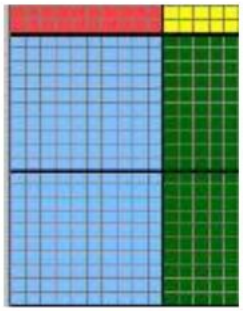
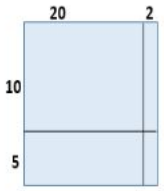
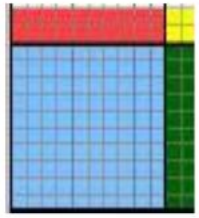
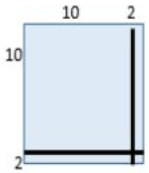
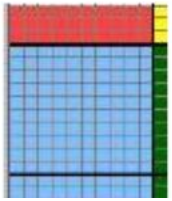
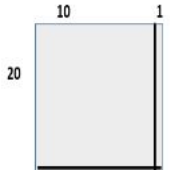
Lesson from KDE to make connections

Problem Card Set A	Base Ten Card Set B	Area Model Card Set C	Distributive Property Card Set D	Partial Products Card Set E
Each pack of baseball cards has fifteen cards. How many cards are in twenty-two packs?			$(20+2)\times(10+5)=$ $20\times10+2\times10+20\times5+2\times5=$	15 X 22 10 20 100 200
How many eggs are in twelve dozen?			$(10+2)\times(10+2)=$ $10\times10+2\times10+10\times2+2\times2=$	12 X 12 4 20 20 100
The boy scouts traveled a distance of twenty-three feet in their boat. The girl scouts traveled eleven			$(20+3)\times(10+1)=$ $20\times10+3\times10+20\times1+3\times1=$	11 X 23 3 30 20

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Multi-Digit Multiplication
Math Story Matching

- Start with Set A, B, C
- Match the story, area model and base ten card
- Students justify their thinking
- Then add Set D and E
- Students justify their thinking

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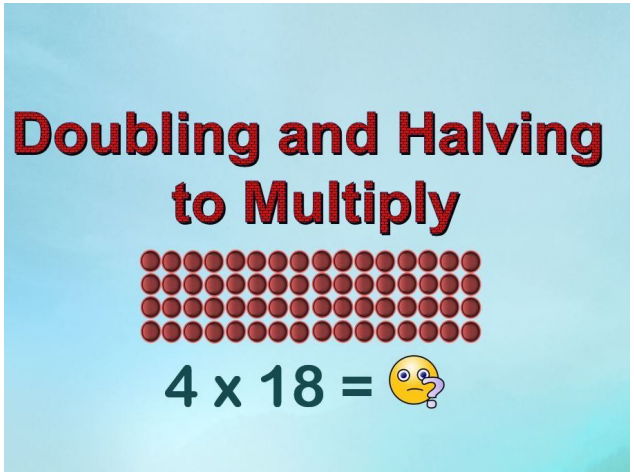
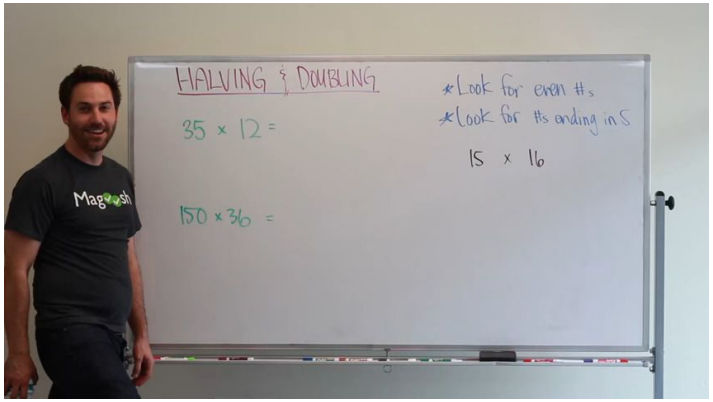
Halving and Doubling Strategy



Click on images to play video



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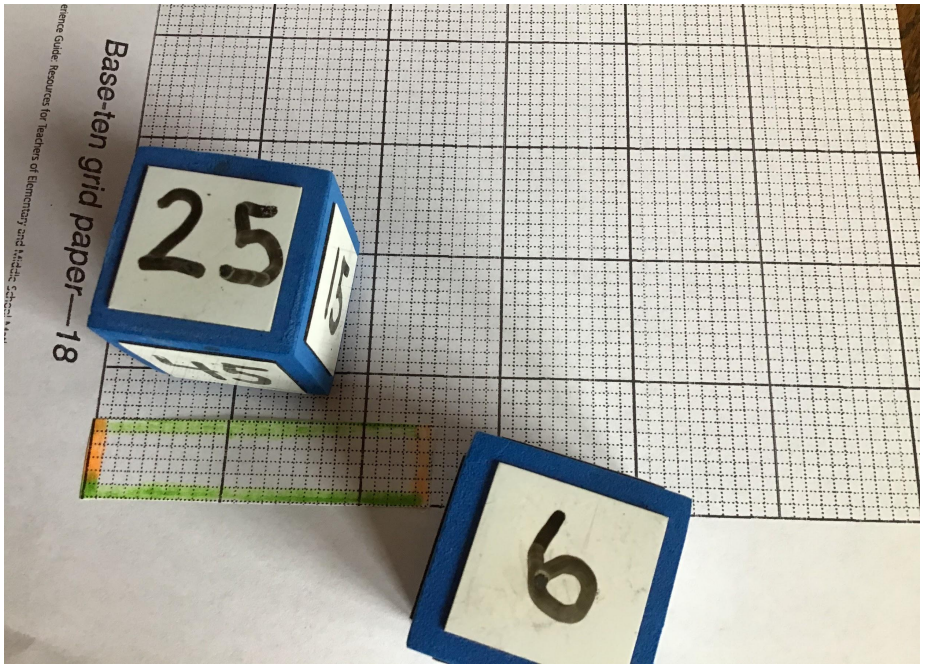
Nice and Easy (halving and doubling)

- Player 1 roll the cubes.
- Say aloud the multiplication sentence represented by the number cubes.
- Draw that area model on the base ten grid paper and cut out.



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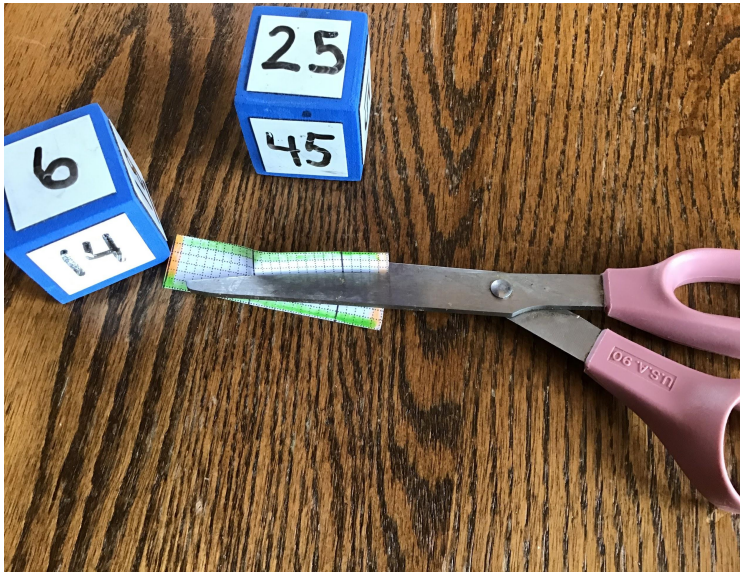
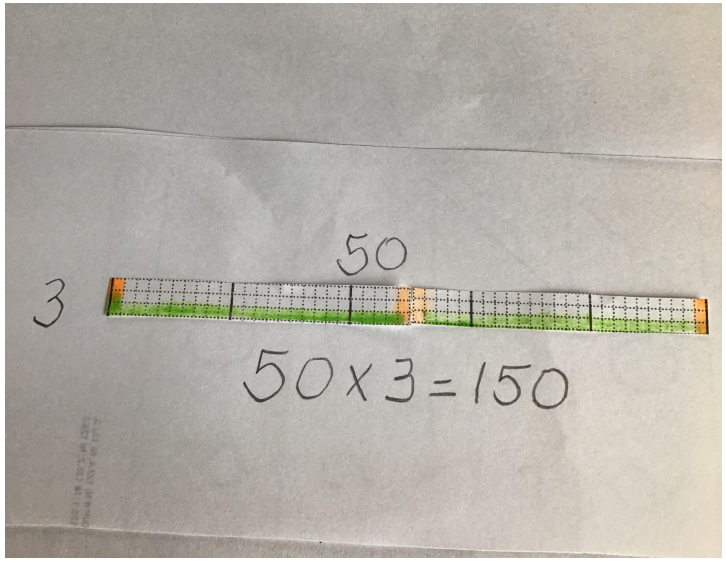
Nice and Easy (halving and doubling)

- Cut the area model in half to create a new multiplication equation.
- Double one factor and half the other to figure out the equivalent multiplication sentence.





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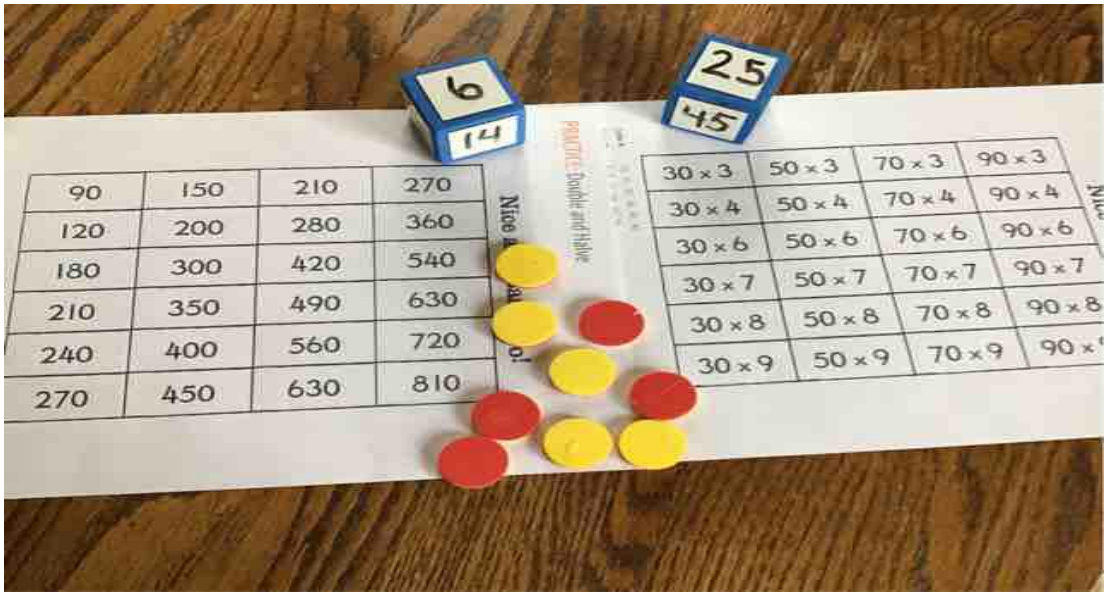
Nice and Easy (halving and doubling)

- Place a counter on the matching multiplication sentence on the *Nice and Easy* game board.
- Calculate and say the product and place a counter on the corresponding product on the *Nice and Easy Too* game board.



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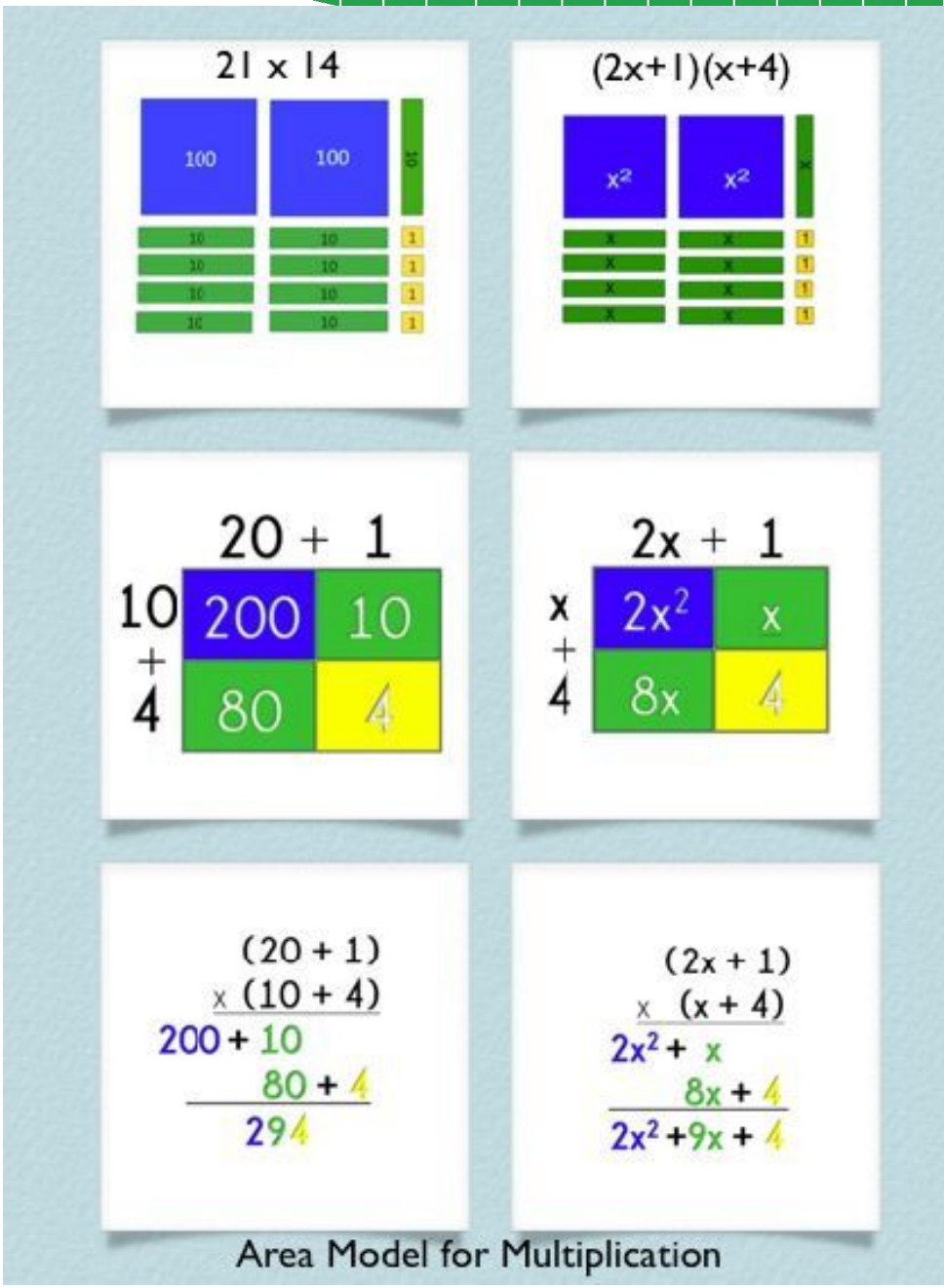
Modeling is the key to conceptual understanding.



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Virtual Manipulatives

https://www.didax.com/math/virtual-manipulatives.html

120 Number Board


Color Tiles


Base Ten Blocks

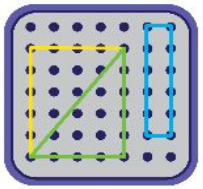
Math Balance


Dice


Spinners


Pattern Blocks

Place Value Disks


Geoboard

Prime Factor Tiles


Algebra Tiles

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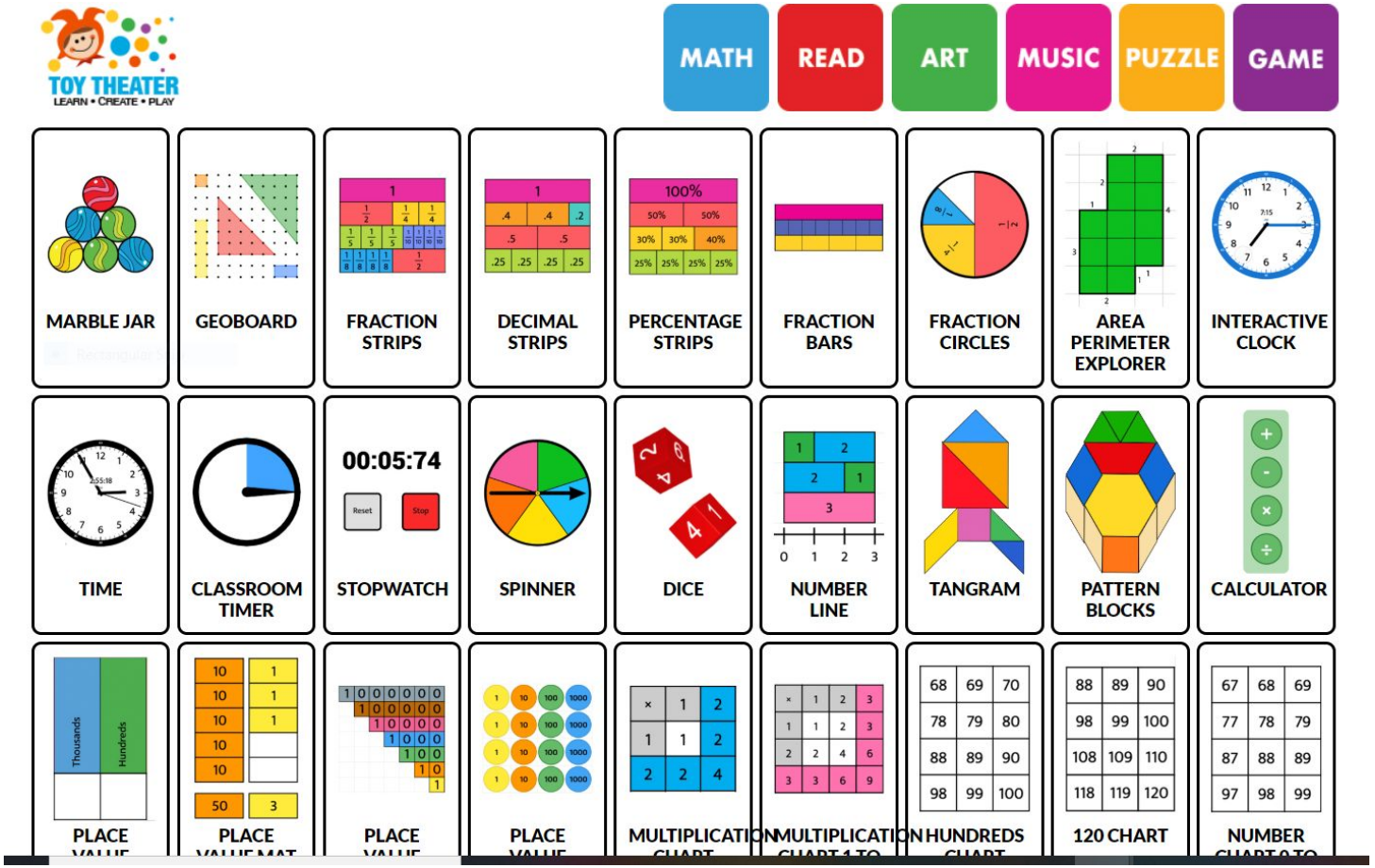
Toy Theater



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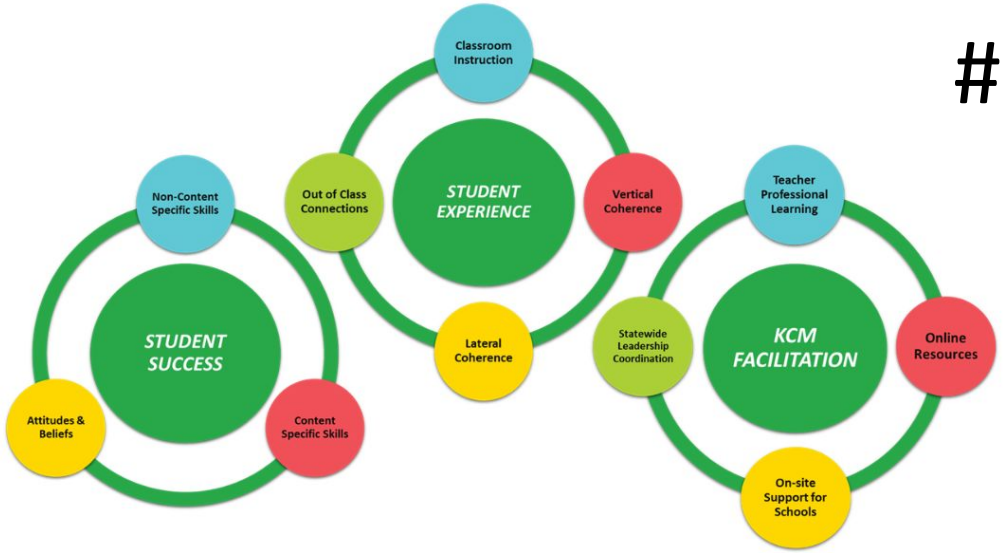
- Kentucky Center for Mathematics is here to support our KY educators
- We are aspire to be a national leader in mathematics education



#BetterTogether

#TeamKCM

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