



KENTUCKY CENTER
FOR MATHEMATICS

Developing Multiplicative Thinking-

*Multiplication Strategies
beyond 100 with Leah DixWhite*



Your host

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GOOD NEWS

KCM Launches Multi-Series Virtual PD

Find out more in this month's article!



Good News!

The KCM is hard at work to ensure Kentucky teachers have access to innovative professional development from home.

Through the newly launched [KCM Virtual](#) site, mathematics teachers from all grade levels will have access to live zoom meetings, video records and corresponding materials. [Read more.](#)

[Focus on Fractions - May 4 - May 8](#)

[Focus on Geometry - May 11 - May 15](#)

[More Multiplicative Thinking - May 18 - May 22](#)

Today's Session

- Standards
- Research
- Strategies
 - Multiplication Line Jumps
 - Arrow Notation
 - Area Models
- Virtual Resources

Standards

Number and Operations in Base Ten

Note: grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.

Standards for Mathematical Practice

[MP.1.](#) Make sense of problems and persevere in solving them.
[MP.2.](#) Reason abstractly and quantitatively.
[MP.3.](#) Construct viable arguments and critique the reasoning of others.
[MP.4.](#) Model with mathematics.

[MP.5.](#) Use appropriate tools strategically.
[MP.6.](#) Attend to precision.
[MP.7.](#) Look for and make use of structure.
[MP.8.](#) Look for and express regularity in repeated reasoning.

Cluster: Use place value understanding and properties of operations to perform multi-digit arithmetic.

Standards

KY.4.NBT.4 Fluently add and subtract multi-digit whole numbers using an algorithm.

MP.2, MP.8

Clarifications

Students make connections from previous work with addition and subtraction, using models/representations to develop an efficient algorithm to add and subtract multi-digit numbers. These are types of algorithms/strategies one could possibly use (but not limited to) to solve adding and subtracting multi-digit whole numbers.

Standard Algorithm	Expanded Form	Models
$\begin{array}{r} 542 \\ + 63 \\ \hline 605 \end{array}$	$\begin{array}{l} 542 + 63 = \\ 500 + 40 + 2 \\ + 60 + 3 \\ \hline 500 + 100 + 5 = 605 \end{array}$	

Coherence [KY.3.NBT.2](#) → [KY.4.NBT.4](#) → [KY.5.NBT.5](#)

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

Students use a variety of models (rectangular arrays and area models) and strategies to represent multi-digit factors times a one-digit factor and a two-digit number by a two-digit number. Students also connect their reasoning to a written equation.

Some examples include:

$$\begin{array}{r} 30 \quad 9 \\ 10 \quad \boxed{300} \quad \boxed{90} \\ 5 \quad \boxed{150} \quad \boxed{45} \\ + 300 \\ \hline 585 \end{array}$$

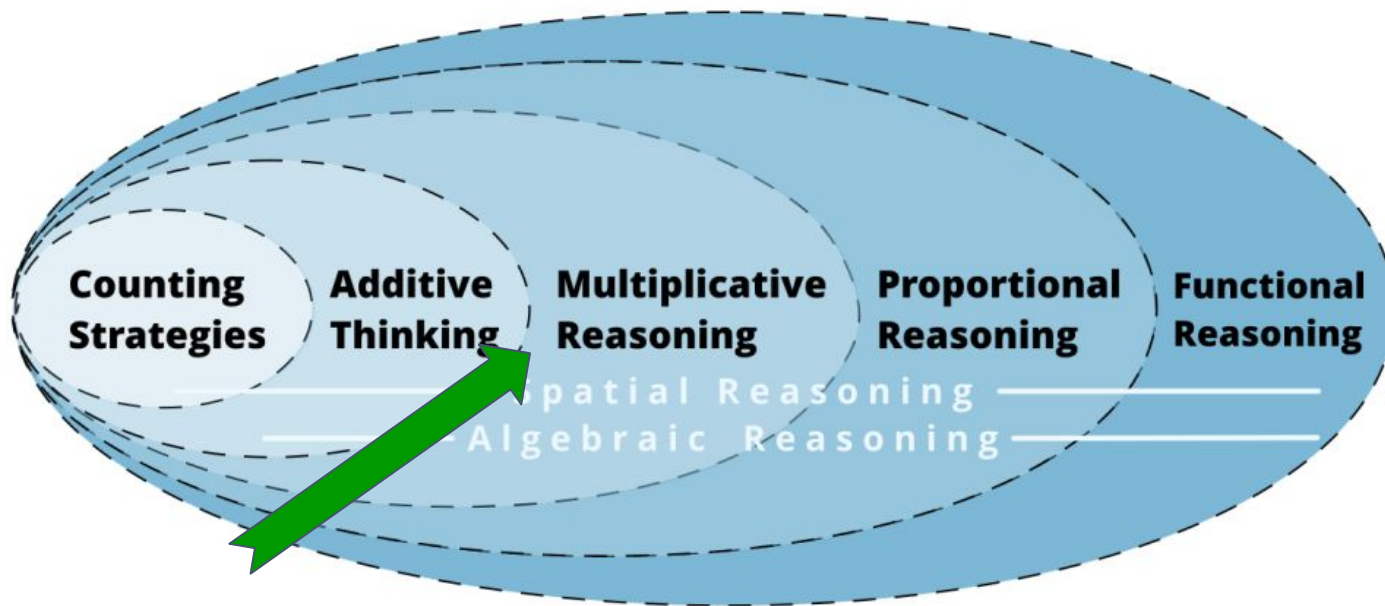
$$\begin{array}{r} 10 \quad 3 \\ 10 \quad \boxed{100} \quad \boxed{30} \\ 2 \quad \boxed{20} \quad \boxed{6} \\ \hline 156 \end{array}$$

$$7 \times 16 =$$

$$7 \times (10 + 6) =$$

$$70 + 42 = 112$$

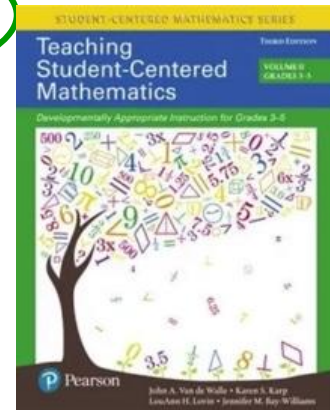
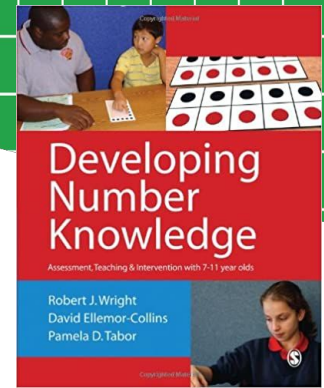
The Development of Mathematical Reasoning



PAM HARRIS

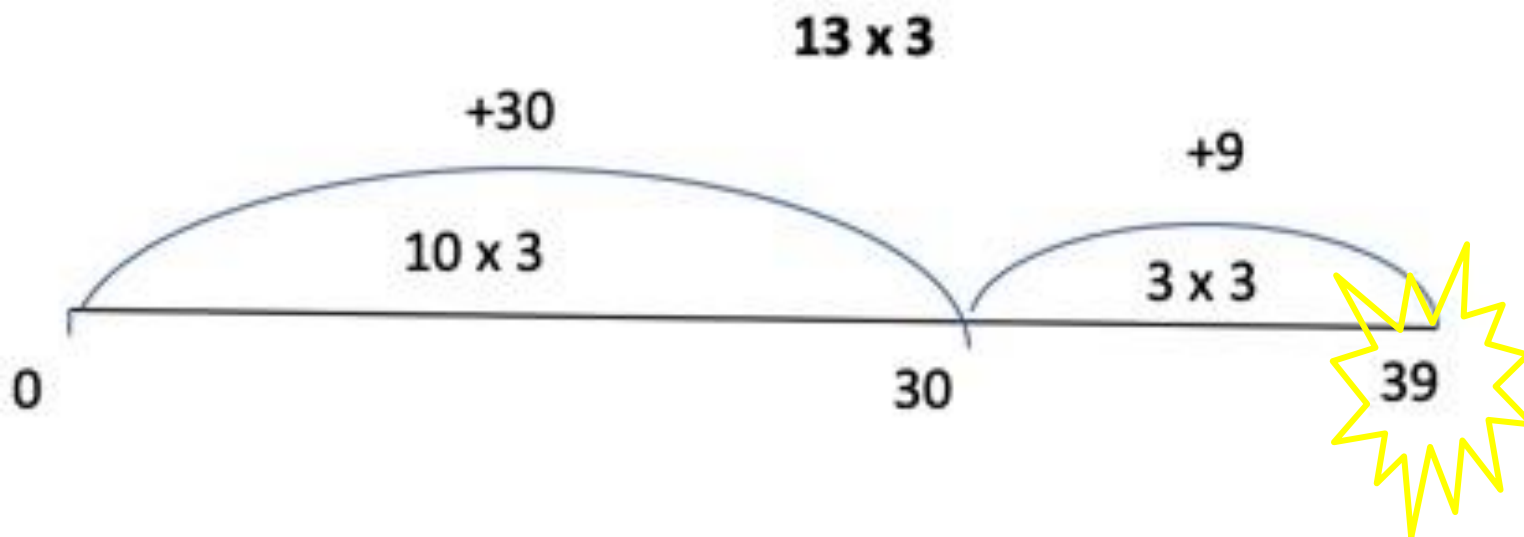
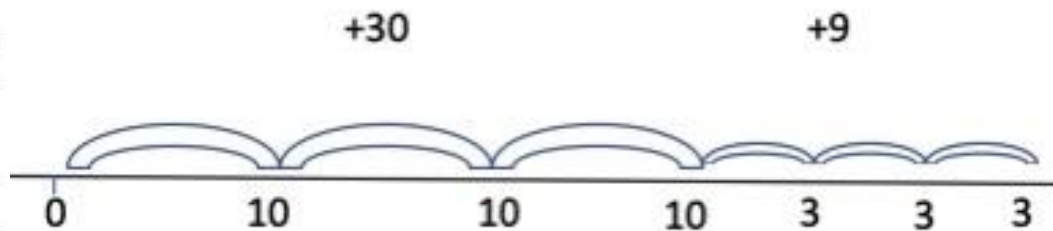
Instructional Phases of Multiplication and Division

1. Building on students' emergent strategies
2. Instruction on sequences of multiples
3. Structuring numbers multiplicatively
4. Developing strategies for 1- digit factors
5. Habituation of basic facts
6. Extending to multi-digit factors and beyond 100.



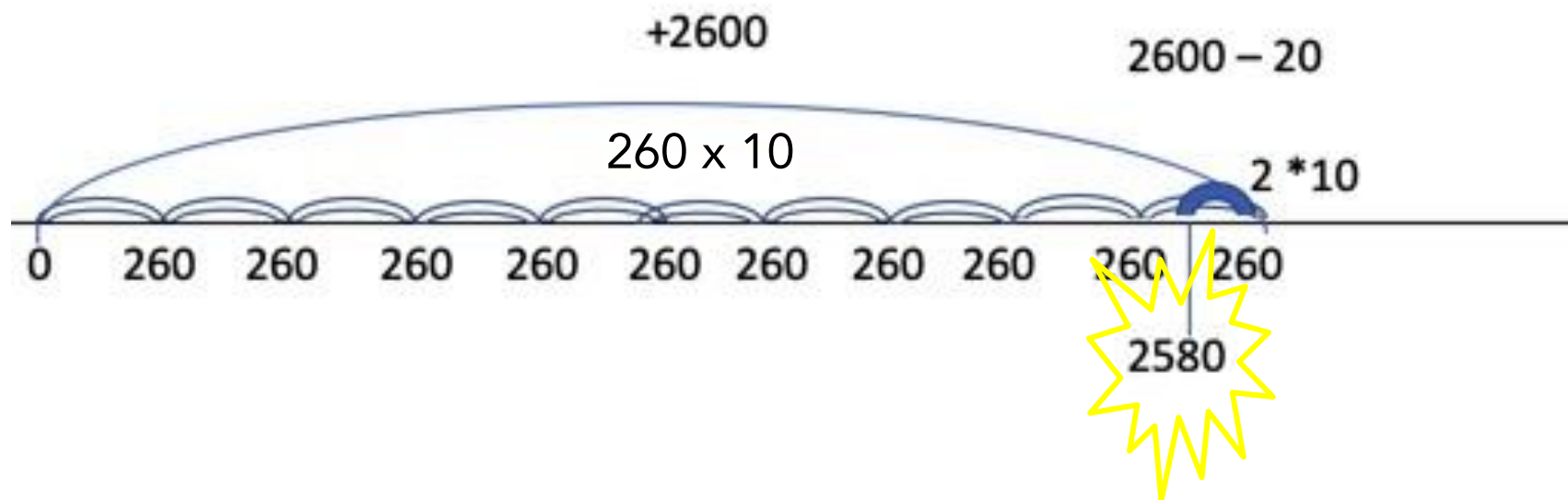
Multiplication Line Jumps

$$13 \times 3$$



Multiplication Line Jumps

$$258 \times 10$$



Arrow Notation Multiplication

130 x 3: $100 \times 3 \longrightarrow 300$, $30 \times 3 \longrightarrow 90$, $300 + 90 \longrightarrow 390$

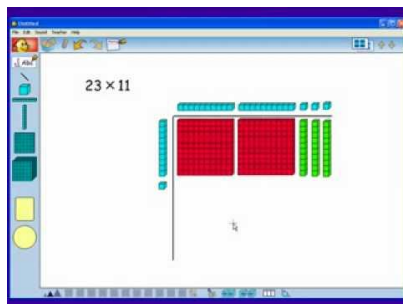
397 x 4: $400 \times 4 \longrightarrow 1600$, $3 \times 4 \longrightarrow 12$, $1600 - 12 \longrightarrow 1588$

204 x 5: $200 \times 5 \longrightarrow 1000$, $4 \times 5 \longrightarrow 20$, $1000 + 20 \longrightarrow 1020$

Virtual Area Model Multiplication



[Area Model](#)



GeoGebra

[Area Model Multiplication](#)



Virtual Area Model Multiplication



[Area Model Multiplication](#)
[Arithmetic](#)

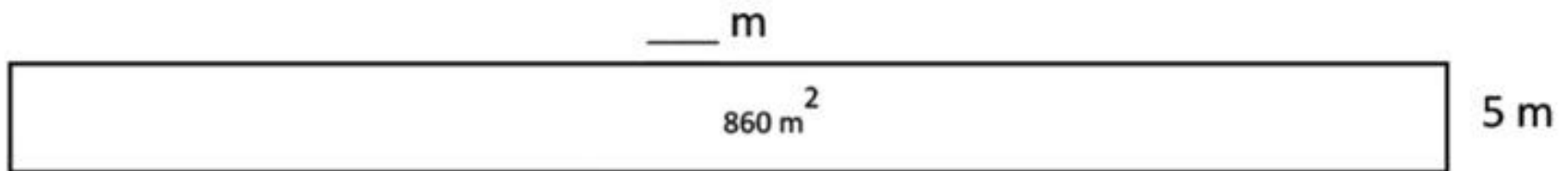


[Bunny Times](#)
[Dynamic Sketches of Area Models](#)

Area Model Division



The contractors say they have enough turf to cover 860 m^2 . If the turf is laid in a strip that is 5 m wide, what is the length of the strip? Use the diagram to show your thinking.



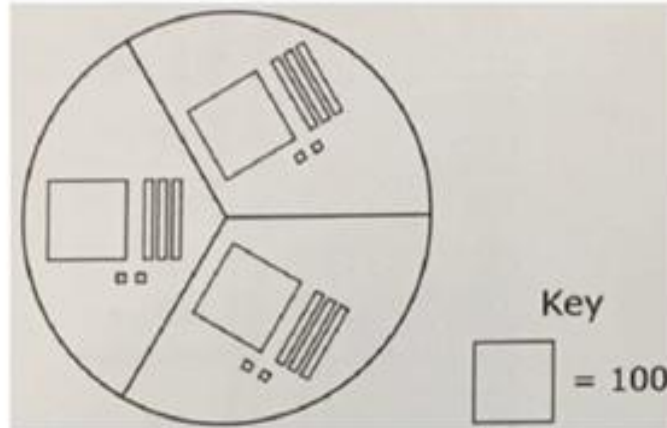
Solution:



$$860 \div 5 = (500 \div 5) + (350 \div 5) + (10 \div 5) = 100 + 70 + 2 = 172$$

Division Equation

Victoria drew the model below to solve a division problem.



Which equation matches Victoria's model?

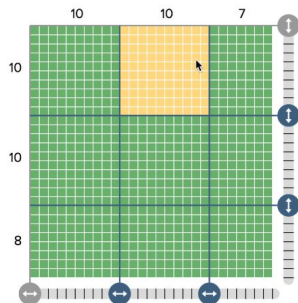
- A. $132 \div 3 = 44$
- B. $132 \div 2 = 66$
- C. $18 \div 3 = 6$
- D. $396 \div 3 = 132$

[Division Area Model](#)



Virtual Resources

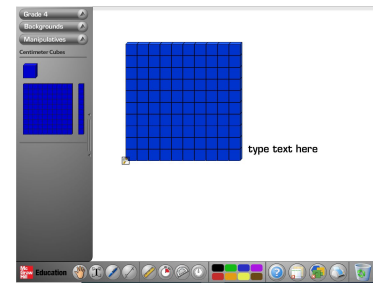
[Partial Product Finder](#)



[Number Line](#)



[Number Pieces](#)



[Glencoe Virtual Interface](#)

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The screenshot shows the KCM website homepage. At the top left is the KCM logo with the text "KENTUCKY CENTER FOR MATHEMATICS". To the right are social media icons for Facebook, Instagram, LinkedIn, Pinterest, and Twitter, followed by a search bar. Below these are navigation links: HOME, MAF, PROFESSIONAL LEARNING, RESOURCES, ANNUAL CONFERENCE, and ABOUT US. The main content area features a large image of a woman wearing a headset, smiling. Below this image is a green banner with the text "GOOD NEWS". The main headline reads "KCM Launches Multi-Series Virtual PD". Below the headline is a sub-headline "Find out more in this month's article!". To the right of the image is a section titled "Good News!" with the text: "The KCM is hard at work to ensure Kentucky teachers have access to innovative professional development from home. Through the newly launched [KCM Virtual](#) site, mathematics teachers from all grade levels will have access to live zoom meetings, video records and corresponding materials. [Read more.](#)" Below this text are three links: "[Focus on Fractions - May 4 - May 8](#)", "[Focus on Geometry - May 11 - May 15](#)", and "[More Multiplicative Thinking - May 18 - May 22](#)".