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FOR MATHEMATICS

Focus on Place Value with Lisa Riggs

Decimal Place Value

Welcome!

Your host

Lisa Riggs

Regional Consultant
Kentucky Center for Mathematics
lriggs2@murraystate.edu

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About me!

- Taught for 29 years
- NBCT 2003
- MIT for 8 years
- Math Recovery specialist, 2007
- AVMR Champion and SNAP facilitator
- KCM RC since, 2015
- Math Recovery leader, 2015
- Faith and Family are important to me.

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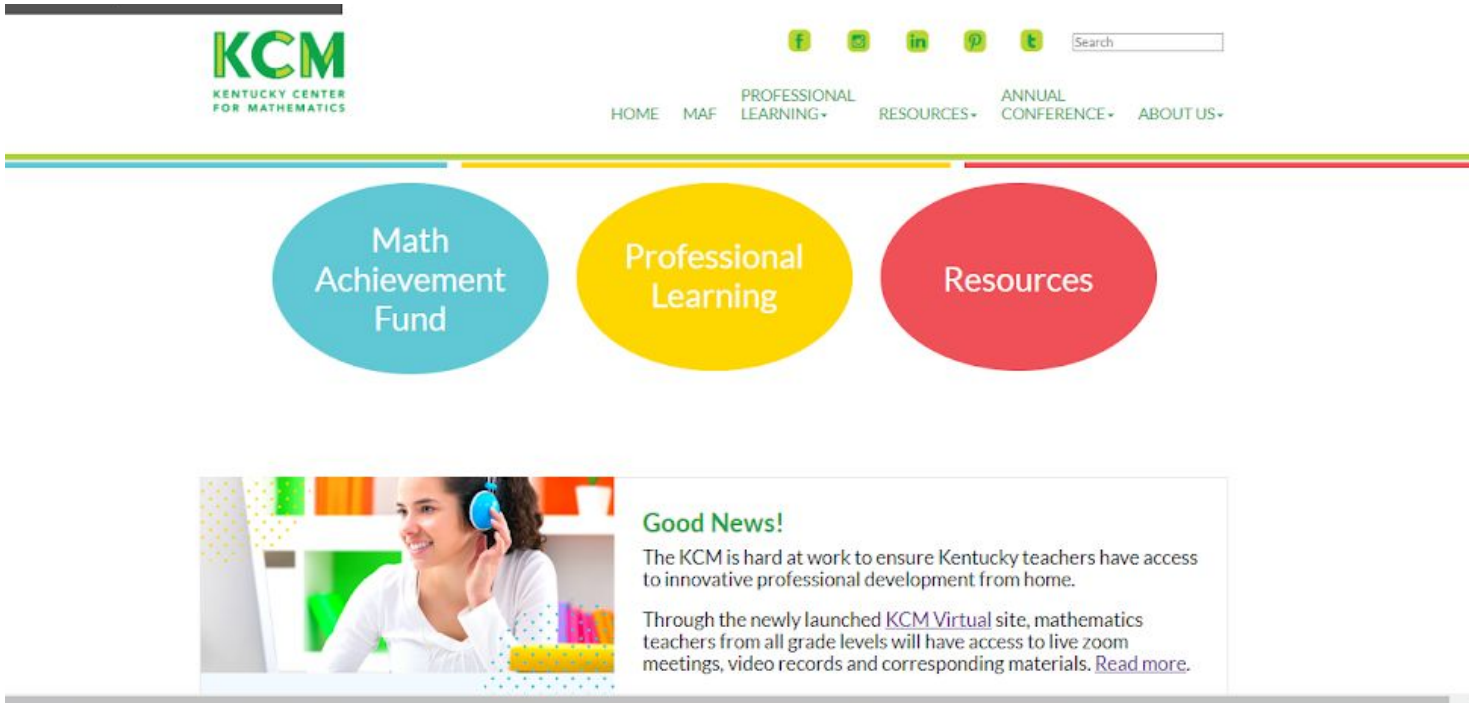
KCM Website



https://www.kentuckymathematics.org/

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Agenda

- A look at the Standards
- A look at Research
- Decimal Place Value Models
- Activities
- Resources

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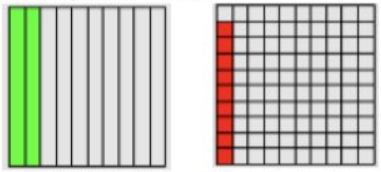
Number and Operations Fractions

Note: grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12 and 100.

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: Understand decimal notation for fractions and compare decimal fractions.

Standards	Clarifications
KY.4.NF.5 Convert and add fractions with denominators of 10 and 100. a. Convert a fraction with a denominator of 10 to an equivalent fraction with a denominator of 100. b. Add two fractions with respective denominators 10 and 100. **MP.5, MP.7**	For example, students express $\frac{3}{10}$ as $\frac{30}{100}$ and add $\frac{3}{10} + \frac{4}{100} = \frac{34}{100}$ Note: Students who generate equivalent fractions develop strategies for adding fractions with unlike denominators in general. Addition and subtraction with unlike denominators in general is not a requirement at grade 4. Coherence KY.3.NF.3→ KY.4.NF.5→KY.5.NBT.7
KY.4.NF.6 Use decimal notation for fractions with denominators 10 or 100. **MP.4, MP.7**	For example, students rewrite 0.62 as $\frac{62}{100}$; describe a length as 0.62 meters; locate 0.62 on a number line. Coherence KY.4.NF.6→KY.5.NBT.3
KY.4.NF.7 Compare two decimals to hundredths. a. Compare two decimals to hundredths by reasoning about their size. b. Recognize that comparisons are valid only when the two decimals refer to the same whole. c. Record the results of comparisons with the symbols >, =, or < and justify the conclusions. **MP.2, MP.3, MP.5**	Students recognize comparisons are valid only when the two decimals refer to the same whole. For example, students use a visual model: seeing 0.2 > 0.09  Coherence KY.4.NF.7→KY.5.NBT.3

Attending to the Standards for Mathematical Practice

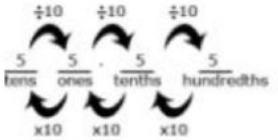
Students consider available tools and choose to use base ten blocks, graph paper, place value charts, number lines and other place value models to explore the relationships between fractions with denominators of 10 and denominators of 100 (**MP.5**). By using these tools, students begin to make abstract and quantitative connections to the relationship between fractions with denominators of 10 and 100 (**MP.2**). Through these experiences and work with fraction models, they build the understanding comparisons between fractions and decimals are only valid when the

Number and Operations in Base Ten

Note: grade 5 expectations in this domain are limited to decimals through the thousandths place.

Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them.	MP.5. Use appropriate tools strategically.
MP.2. Reason abstractly and quantitatively.	MP.6. Attend to precision.
MP.3. Construct viable arguments and critique the reasoning of others.	MP.7. Look for and make use of structure.
MP.4. Model with mathematics.	MP.8. Look for and express regularity in repeated reasoning.

Cluster: Understand the place value system.

Standards	Clarifications
KY.5.NBT.1 Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and $\frac{1}{10}$ of what it represents in the place to its left. **MP.2, MP.7**	In the number 55.55, each digit is 5, but the value of each digit is different because of the placement.  The arrow points to is 1/10 of the 5 to the left and 10 times greater than the 5 to the right. The 5 in the ones place is 1/10 of 50 and 10 times greater than five tenths.  Note: grade 5 expectations in this domain are limited to decimals through the thousandths place. Coherence KY.4.NBT.1→KY.5.NBT.1
KY.5.NBT.2 Multiply and divide by powers of 10. • Explain patterns in the number of zeros of the product when multiplying a number by powers of 10. • Explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. • Use whole-number exponents to denote powers of 10. **MP.3, MP.8**	Students recognize when a number is multiplied by 10, a zero is added to the end because each digit's value became 10 times larger. Students use the same reasoning to explain in the problem. • $523 \times 10^3 = 523{,}000$ The place value of 523 is increased by 3 places. • $5.223 \times 10^2 = 522.3$ The place value of 5.223 is increased by 2 places. • $52.3 \div 10^1 = 5.23$ The place value of 52.3 is decreased by one place. Note: grade 5 expectations in this domain are limited to decimals through the thousandths place. Coherence KY.5.NBT.2→ KY.6.EE.1

Standards	Clarifications
KY.5.NBT.3 Read, write and compare decimals to thousandths. a. Read and write decimals to thousandths using base-ten numerals, number names and expanded form. b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. **MP.2, MP.5, MP.7**	a. For the number 347.392... • number name: three hundred forty-seven and three hundred ninety-two thousandths • expanded form: $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (\frac{1}{10}) + 9 \times (\frac{1}{100}) + 2 \times (\frac{1}{1000})$ Students relate numbers they are comparing back to common benchmarks of 0, $\frac{1}{2}$ (0.5, 0.50 and 0.500) and 1. When comparing numbers, 0.35 and 0.12, students make the connection 0.35 > 0.12, but also see the relationship of 0.12 < 0.35. Note: grade 5 expectations in this domain are limited to decimals through the thousandths place. KY.4.NBT.2 Coherence KY.4.NF.7→ KY.5.NBT.3
KY.5.NBT.4 Use place value understanding to round decimals to any place. **MP.5, MP.7**	Students go beyond application of an algorithm or procedure when rounding. Students demonstrate a deeper understanding of number sense and place value and explain and reason about the answers they get when they round. Note: grade 5 expectations in this domain are limited to decimals through the thousandths place. Coherence KY.4.NBT.3→ KY.5.NBT.4

Attending to the Standards for Mathematical Practice

Students compare the value of the digits based on where they are in a number (**MP.7**). They reason 10 tens equal 100, 70 tens equal 700 and this can be illustrated with base 10 blocks or other visuals (**MP.2**). Students look across series of problems to notice a pattern when multiplying by 10, 100 or 1000 (**MP.8**) and justify why patterns exist (why 36 x 100 = 3600), rather than superficially noting 'you add zeros,' they explain or show there are actually 36 *hundreds*, so 3600 (**MP.3**). Students use similar reasoning to compare decimal values, explaining tenths are larger than hundredths and therefore, they look to first see which values have more tenths before looking at how many hundredths it has (**MP.2**, **MP.7**). Students use tools such as number lines and base 10 blocks to see place value relationships with decimals in order to compare and to round (**MP.5**).

Research

"Research on decimal learning suggests that students have difficulty connecting decimal symbols with pictorial representations. Often students will apply whole-number ideas to decimals, disregard the placement of the decimal point, and invent inconsistent algorithms based on their interpretation of the situations."

Kathleen Cramer, et al. "5 Indicators of Decimal Understandings." *Teaching Children Mathematics*, vol. 22, no. 3, 2015, pp. 186–195., doi:10.5951/teacchilmath.22.3.0186. Accessed 13 2020.

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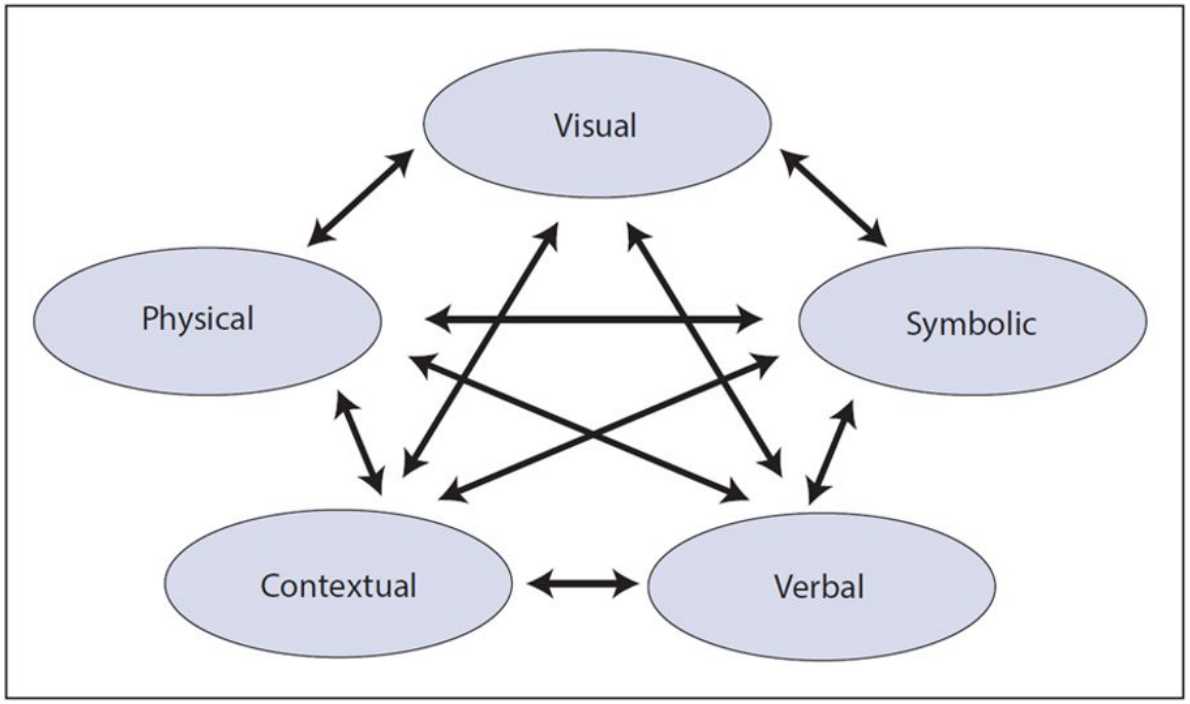
Use & Connect Mathematical Representations



Mathematics Teaching Practices
Establish mathematics goals to focus learning. Effective teaching of mathematics establishes clear goals for the mathematics that students are learning, situates goals within learning progressions, and uses the goals to guide instructional decisions.
Implement tasks that promote reasoning and problem solving. Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies.
Use and connect mathematical representations. Effective teaching of mathematics engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving.
Facilitate meaningful mathematical discourse. Effective teaching of mathematics facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments.
Pose purposeful questions. Effective teaching of mathematics uses purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships.
Build procedural fluency from conceptual understanding. Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems.
Support productive struggle in learning mathematics. Effective teaching of mathematics consistently provides students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships.
Elicit and use evidence of student thinking. Effective teaching of mathematics uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning.

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Models used to Develop Conceptual Understanding of Decimal Place Value

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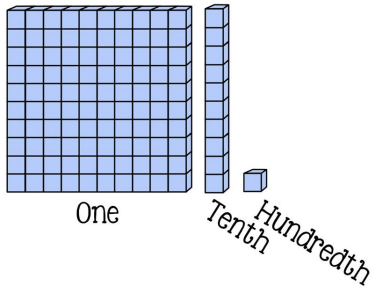
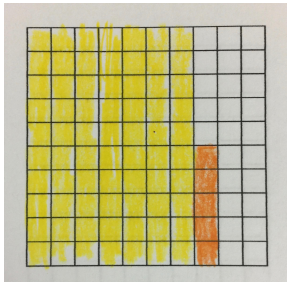
Decimal place value models

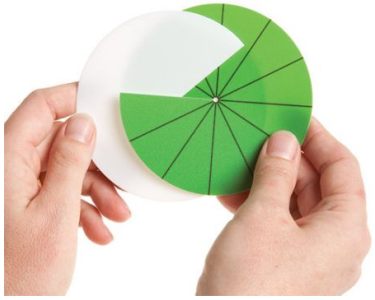
Area:
base-ten materials
2D(paper) & 3D



10 x 10 grid



rational number wheel



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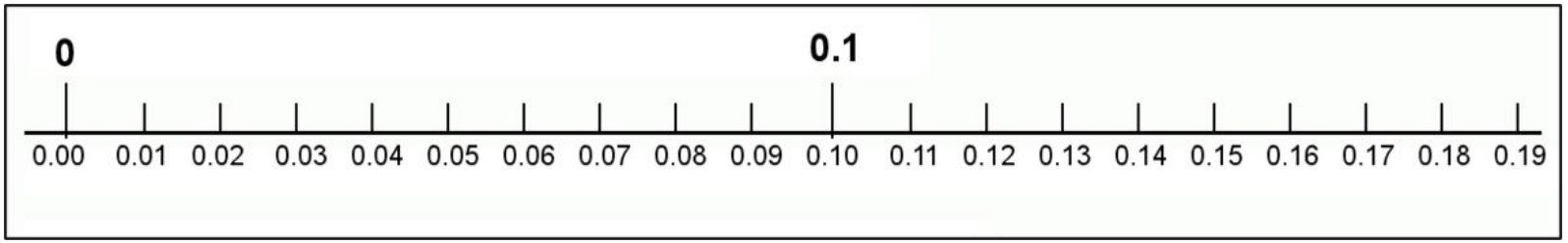
Decimal place value models

Length:

meter stick

number line



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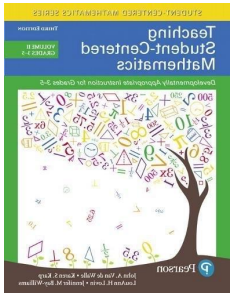
Decimal place value models

What about money??

According to Teaching Student-Centered Mathematics, vol. II, grades 3 -5, for students money is almost always a two-place decimal system and the physical models are nonproportional. Students' initial contact with decimals should be more flexible so money is **not** recommended as an **initial** model for decimals, although it is an important application of decimal numeration.



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Activities to Develop Conceptual Understanding of Decimal Place Value

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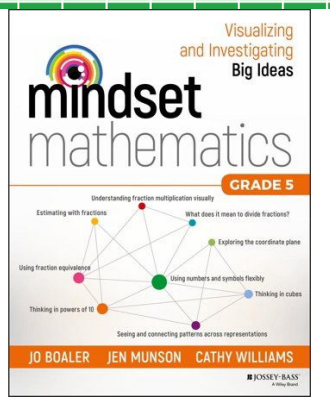
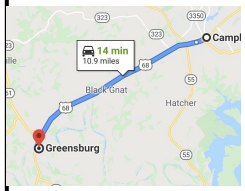
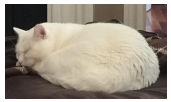
The Unit of You



In this activity students explore place value relationships with themselves as the unit. Encourage students to find things that would complete the chart using themselves as the unit of one in the center. Students should add the description of the object to the chart along with a picture. This is an activity that takes some thought and time.

thousands	hundreds	Tens	UNITS (ones)	tenths	hundredths	thousandths
						

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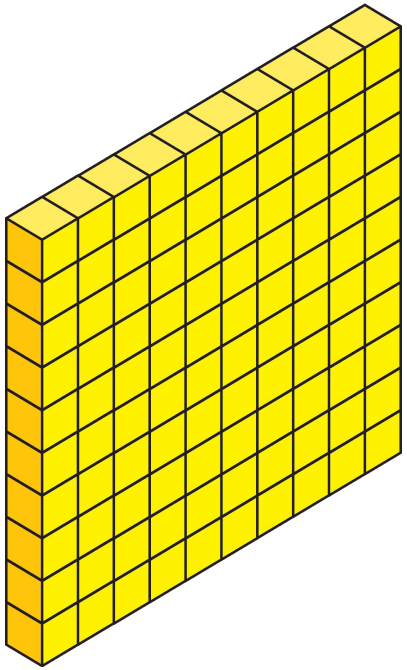
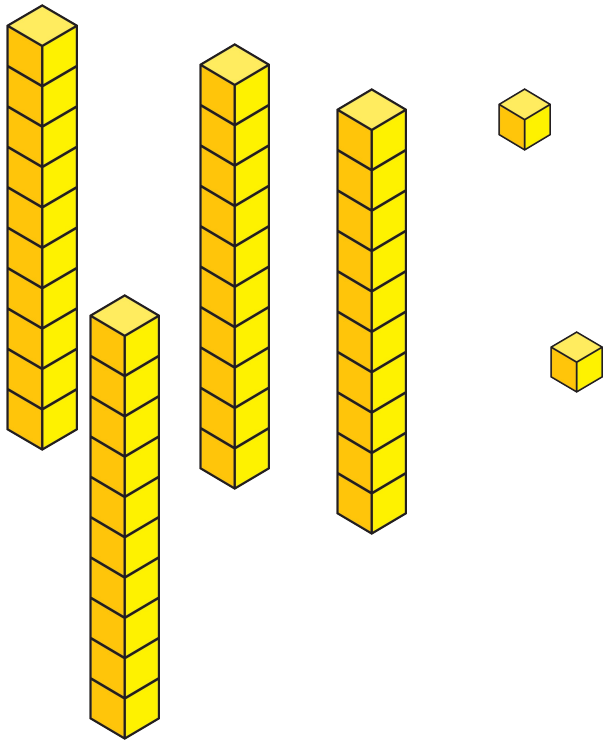
Adapted from: Williams, Cathy, et al. *Mindset Mathematics: Visualizing and Investigating Big Ideas, Grade 5*, Jossey Bass Inc, 2018.

Shifting Units

The Unit is:



What is the amount shown?



0.42

forty-two hundredths

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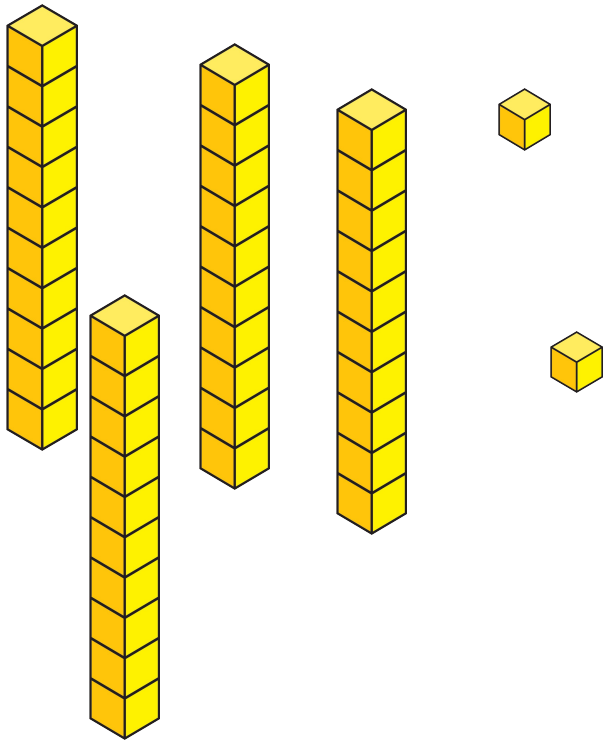
Shifting Units

The Unit is:

What is the amount shown?



4.2

four and two tenths

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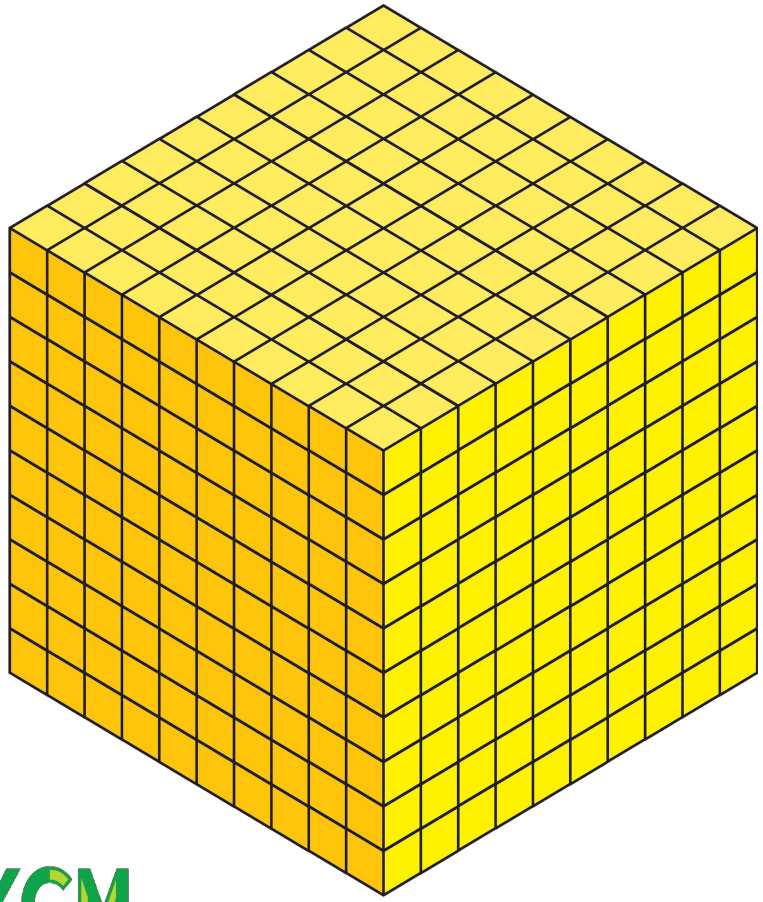
Shifting Units

The Unit is:



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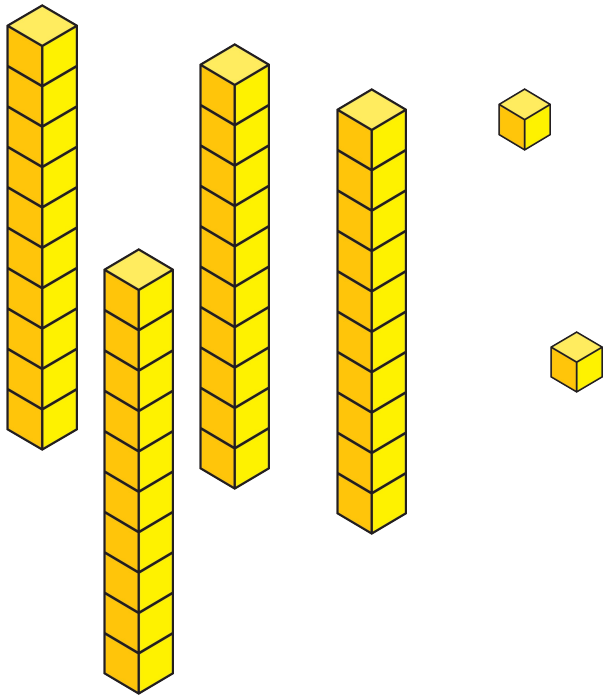

0.042

forty-two thousandths

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Decimal Roll and Cover

Decimal Spinner

Easy Decimals

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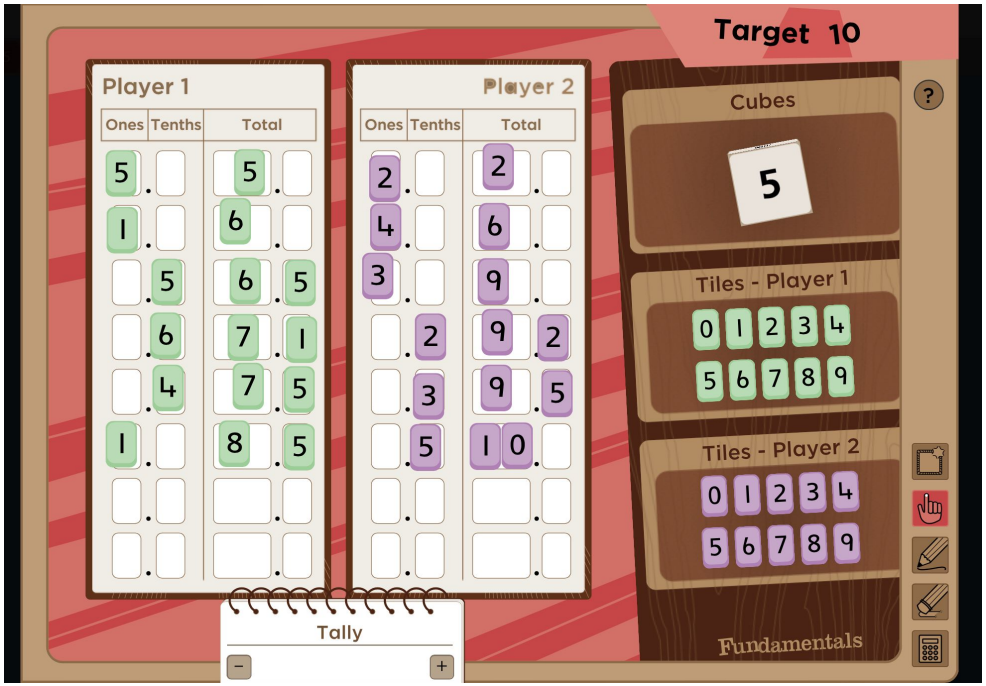
Origo Fundamentals

[Origo Home]



First to One, Red book page 60 - 63

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Resources:

zoomable number

ictgames decimal demonstrator

ictgames flip counter

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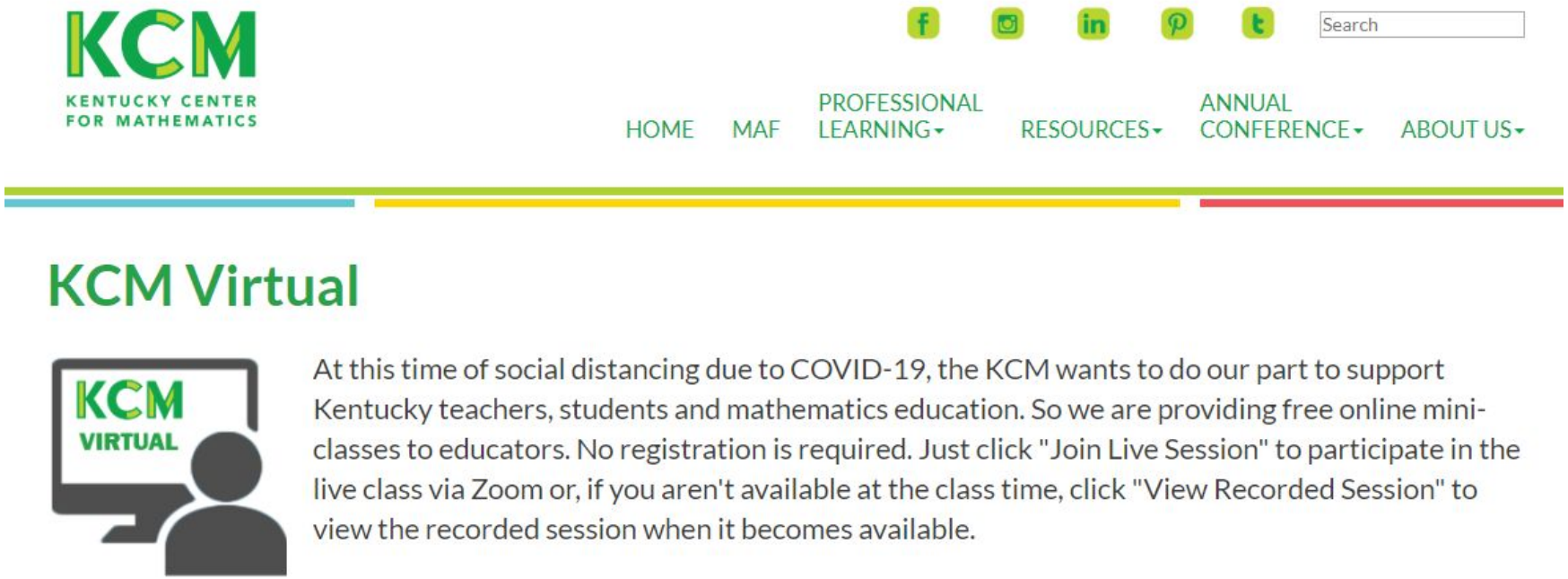

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KCM is here to support you!

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Lisa Riggs

Regional Consultant
Kentucky Center for Mathematics
lriggs2@murraystate.edu

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