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Focus on Fractions:

Fractions Foundations

Welcome!

Your host

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KCM Website

www.kentuckymathematics.org

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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

And the math continues with these sessions under development:

Focus on Geometry - May 11 - May 15

More Multiplicative Thinking - May 18 - May 22

Focus on Measurement & Data - May 26 - May 29

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Today's Agenda

- Research
- Foundations in Geometry
  - Standards
  - Resources
- Introducing fractions and fraction notation
  - Standards
  - Resources

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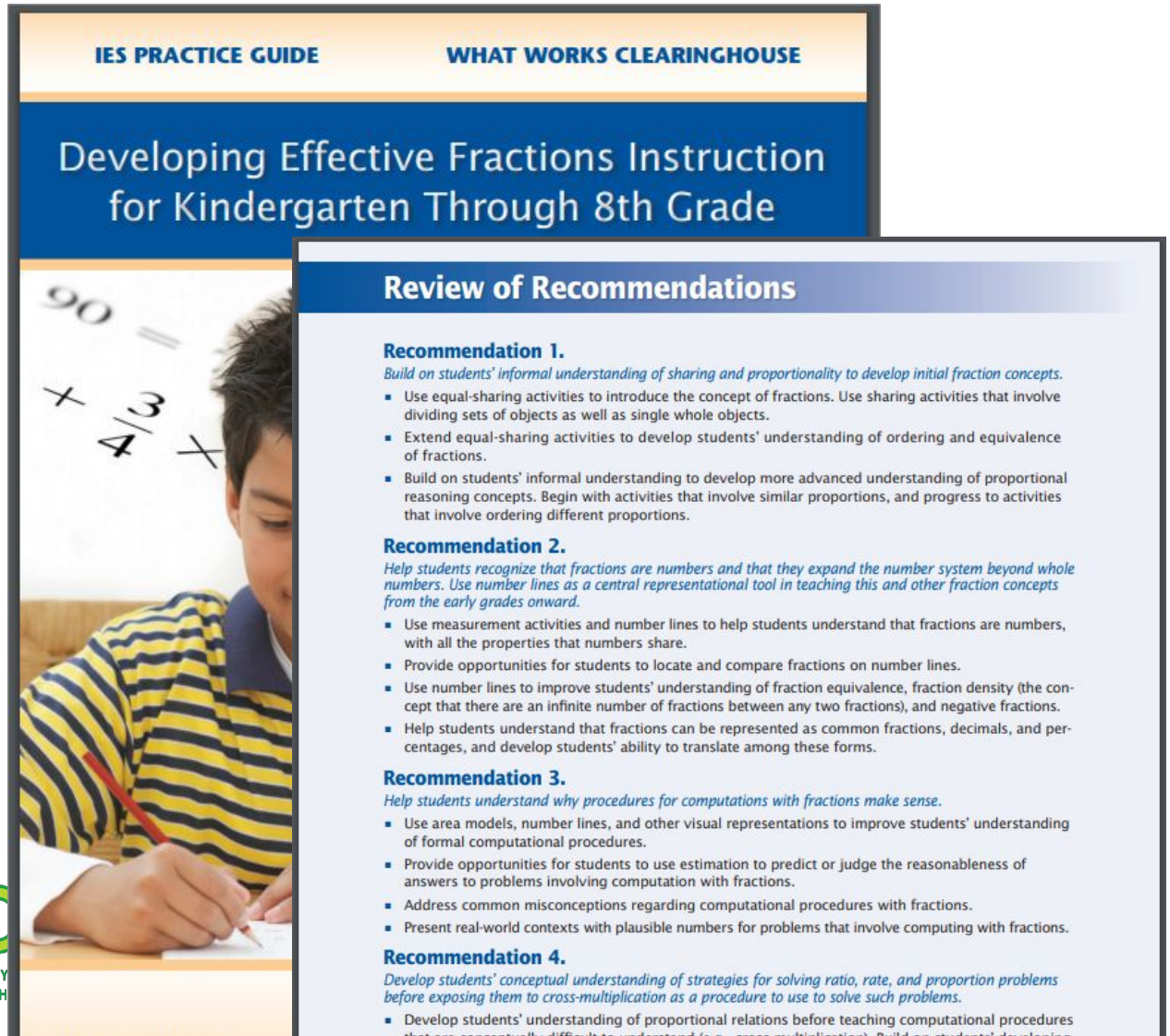
Research



IES PRACTICE GUIDE WHAT WORKS CLEARINGHOUSE

Developing Effective Fractions Instruction for Kindergarten Through 8th Grade

Review of Recommendations

Recommendation 1.

Build on students' informal understanding of sharing and proportionality to develop initial fraction concepts.

- Use equal-sharing activities to introduce the concept of fractions. Use sharing activities that involve dividing sets of objects as well as single whole objects.
- Extend equal-sharing activities to develop students' understanding of ordering and equivalence of fractions.
- Build on students' informal understanding to develop more advanced understanding of proportional reasoning concepts. Begin with activities that involve similar proportions, and progress to activities that involve ordering different proportions.

Recommendation 2.

Help students recognize that fractions are numbers and that they expand the number system beyond whole numbers. Use number lines as a central representational tool in teaching this and other fraction concepts from the early grades onward.

- Use measurement activities and number lines to help students understand that fractions are numbers, with all the properties that numbers share.
- Provide opportunities for students to locate and compare fractions on number lines.
- Use number lines to improve students' understanding of fraction equivalence, fraction density (the concept that there are an infinite number of fractions between any two fractions), and negative fractions.
- Help students understand that fractions can be represented as common fractions, decimals, and percentages, and develop students' ability to translate among these forms.

Recommendation 3.

Help students understand why procedures for computations with fractions make sense.

- Use area models, number lines, and other visual representations to improve students' understanding of formal computational procedures.
- Provide opportunities for students to use estimation to predict or judge the reasonableness of answers to problems involving computation with fractions.
- Address common misconceptions regarding computational procedures with fractions.
- Present real-world contexts with plausible numbers for problems that involve computing with fractions.

Recommendation 4.

Develop students' conceptual understanding of strategies for solving ratio, rate, and proportion problems before exposing them to cross-multiplication as a procedure to use to solve such problems.

- Develop students' understanding of proportional relations before teaching computational procedures

Link: https://ies.ed.gov/ncee/wwc/Docs/PracticeGuide/fractions_pg_093010.pdf

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IES Recommendations

1. Build on students' informal understandings of sharing and proportionality to develop initial fraction concepts.

Today's Focus!

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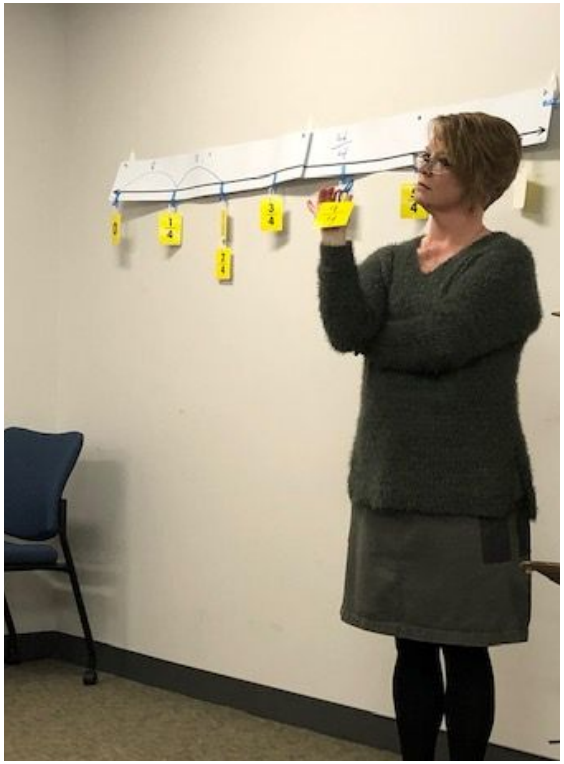
IES Recommendations

2. Help students recognize that **fractions are numbers** and they expand the number system beyond whole numbers. Use **number lines** as a central recommendation tool in teaching this and other fraction concepts from the early grades on.



Tuesday's session with Dee will focus on Number Lines!

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IES Recommendations

3. Help students **understand** why procedures for computations with fractions make sense.

May 6	2:00-2:30 p.m. EDT	**Fraction Operations: Addition & Subtraction with Common Denominators** **Facilitated by:** Leah Dix White **Downloads:** TBD Check back 30 minutes before the session for the meeting link.
May 7	2:00-2:30 p.m. EDT	**Fraction Operations: Addition & Subtraction with Unlike Denominators** **Facilitated by:** Lisa Riggs **Downloads:** TBD Check back 30 minutes before the session for the meeting link.
May 8	2:00-2:30 p.m. EDT	**Fraction Operations: Multiplication & Division** **Facilitated by:** Kelly DeLong **Downloads:** TBD Check back 30 minutes before the session for the meeting link.

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IES Recommendations

4. Develop students' conceptual understanding of strategies for solving ratio, rate, and proportion problems before exposing them to cross-multiplication as a procedure to use to solve such problems.

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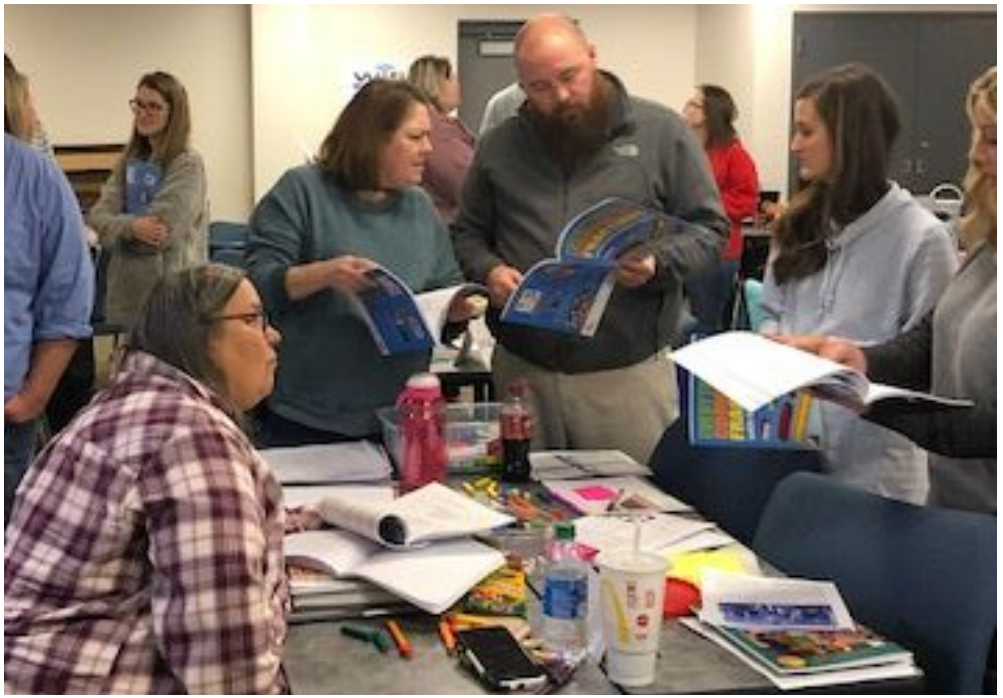
IES Recommendations

5. Professional development programs should place a high priority on improving teachers' understanding of fractions and how to teach them.



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Recommendation 1

Build on students' informal understanding of sharing and proportionality to develop initial fraction concepts.

Students come to kindergarten with a rudimentary understanding of basic fraction concepts. They can share a set of objects equally among a group of people (i.e., equal sharing)[21] *and identify equivalent proportions of common shapes (i.e., proportional reasoning).*[22]

By using this early knowledge to introduce fractions, teachers allow students to build on what they already know. This facilitates connections between students' intuitive knowledge and formal fraction concepts. The panel recommends using sharing activities to develop students' understanding of ordering and equivalence relations among fractions.

Sharing activities can introduce children to several of the basic interpretations of fractions discussed in the introduction. Sharing can be presented in terms of division—such as by partitioning 12 candies into four equally numerous groups. Sharing also can be presented in terms of ratios; for example, if three cakes are shared by two children, the ratio of the number of cakes to the number of children is 3:2.

Although fractions are typically introduced by 1st or 2nd grade, both the sharing and the proportional reasoning activities described in this recommendation can begin as early as preschool or kindergarten.

Link:
https://ies.ed.gov/ncee/wwc/Docs/PracticeGuide/fractions_pg_093010.pdf

Fractions start in the Geometry strand in 1st grade

KY.1.G.3 Partition circles and rectangles into two and four equal shares, describe the shares using the words *halves*, *fourths* and *quarters*, and use the phrases *half of*, *fourth of* and *quarter of*. Describe the whole as two of or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares. **MP.3, MP.6**	Students see the relationship of taking the same shape and partitioning it into equal pieces. For example, they compare the size of the pieces when it's half of a shape or a fourth of the shape. 

- Partition circles and rectangles into two and four equal shares, describe the shares using the words *halves*, *fourths*, and *quarters*, and use the phrases *half of*, *fourth of*, and *quarter of*.
- Describe the whole as two of or four of the shares.
- Understand for these examples that decomposing into more equal shares creates smaller shares

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Build on students' understanding of sharing

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first grade KATE

https://www.firstgradekate.com/2014/01/hands-on-fractions-using-playdough-to.html

Sunday, January 5

Hands-On Fr
To Show Equ

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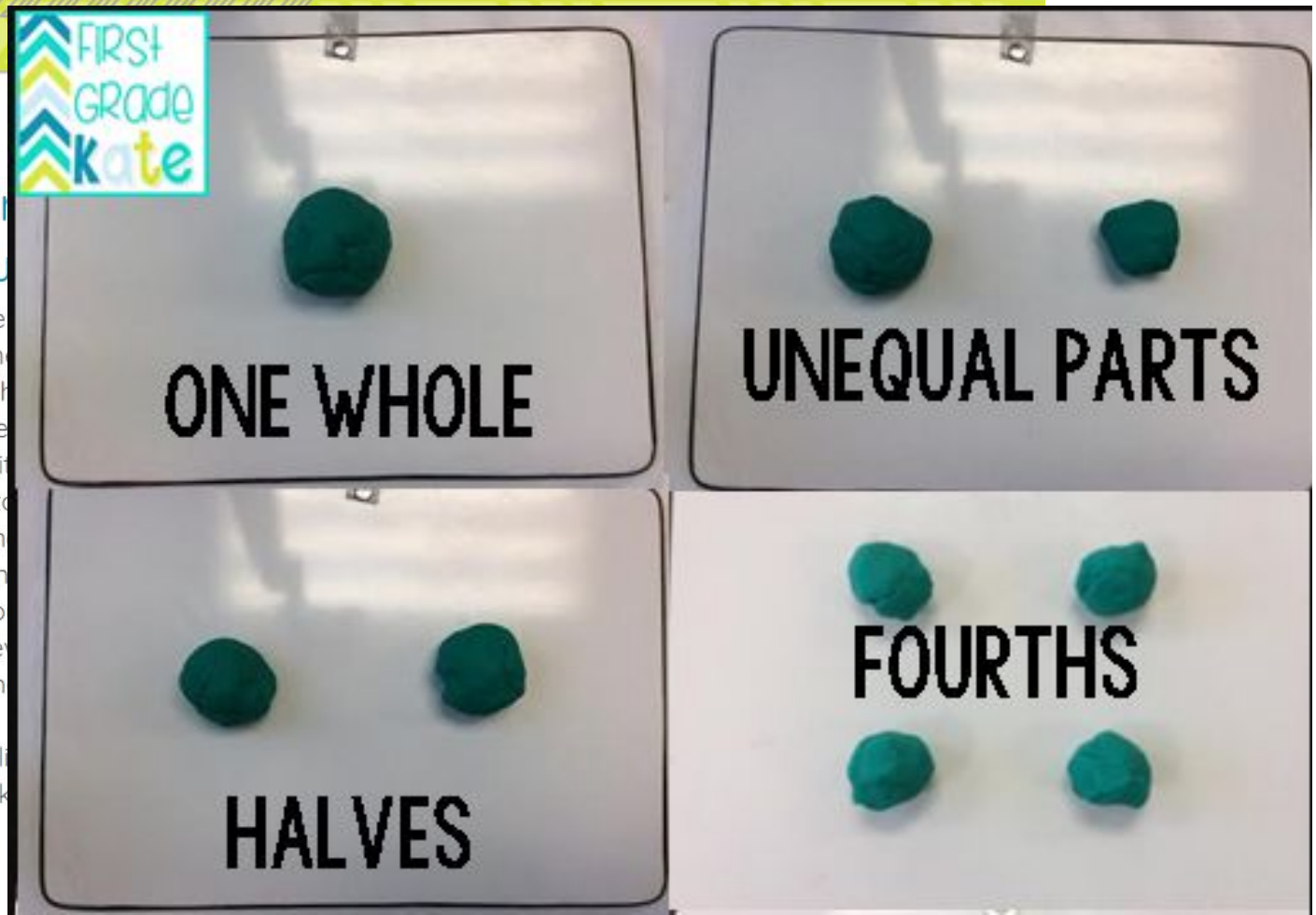
understand. They kne
couldn't tell me what h

One day, I was struggli
Playdough on my desk



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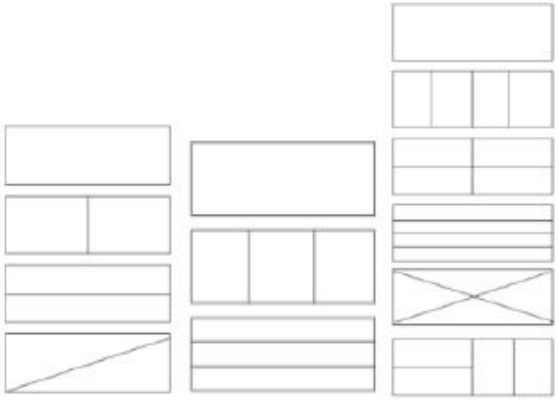
Moving into 2nd grade

KY.2.G.3 Partition circles and rectangles into two, three, or four equal shares; describe the shares using the words *halves*, *thirds*, *half of*, *a third of*, etc.; and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape. **MP.2, MP.3**	Students explore rectangles and circles being partitioned in multiple ways to recognize that equal shares may be different shapes within the same whole.  halves thirds fourths Coherence KY.1.G.3→KY.2.G.3→KY.3.NF.1

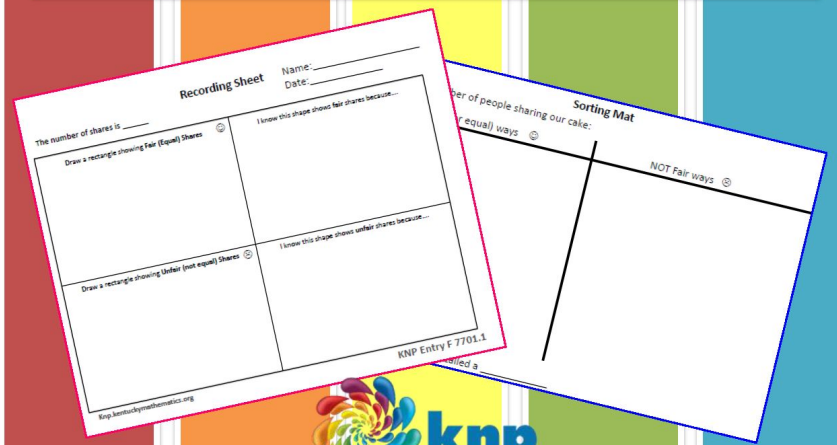
- Build on prior work and extend to *thirds*
- Recognize that equal shares of identical wholes need not have the same shape

Fraction Squares - I can share!

KNP Task # F 7701.1

I can partition rectangles to make two, three or four equal shares.

Lesson Plans, Student Instructions, and Printables available through the KNPIG.



Print version:

http://knp.kentuckymathematics.org/knp/landings.php?act_id=7701.1&prefix=F

Virtual Version:

https://www.kentuckymathematics.org/vr_fractions.php#frac-7

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Fraction Squares - I can share!

http://knp.kentuckymathematics.org/knp/landings.php?act_id=7701.1&prefix=F

KNP Task # F.7701.1

I can partit
make two, t
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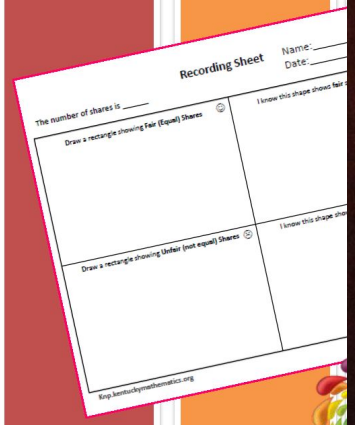
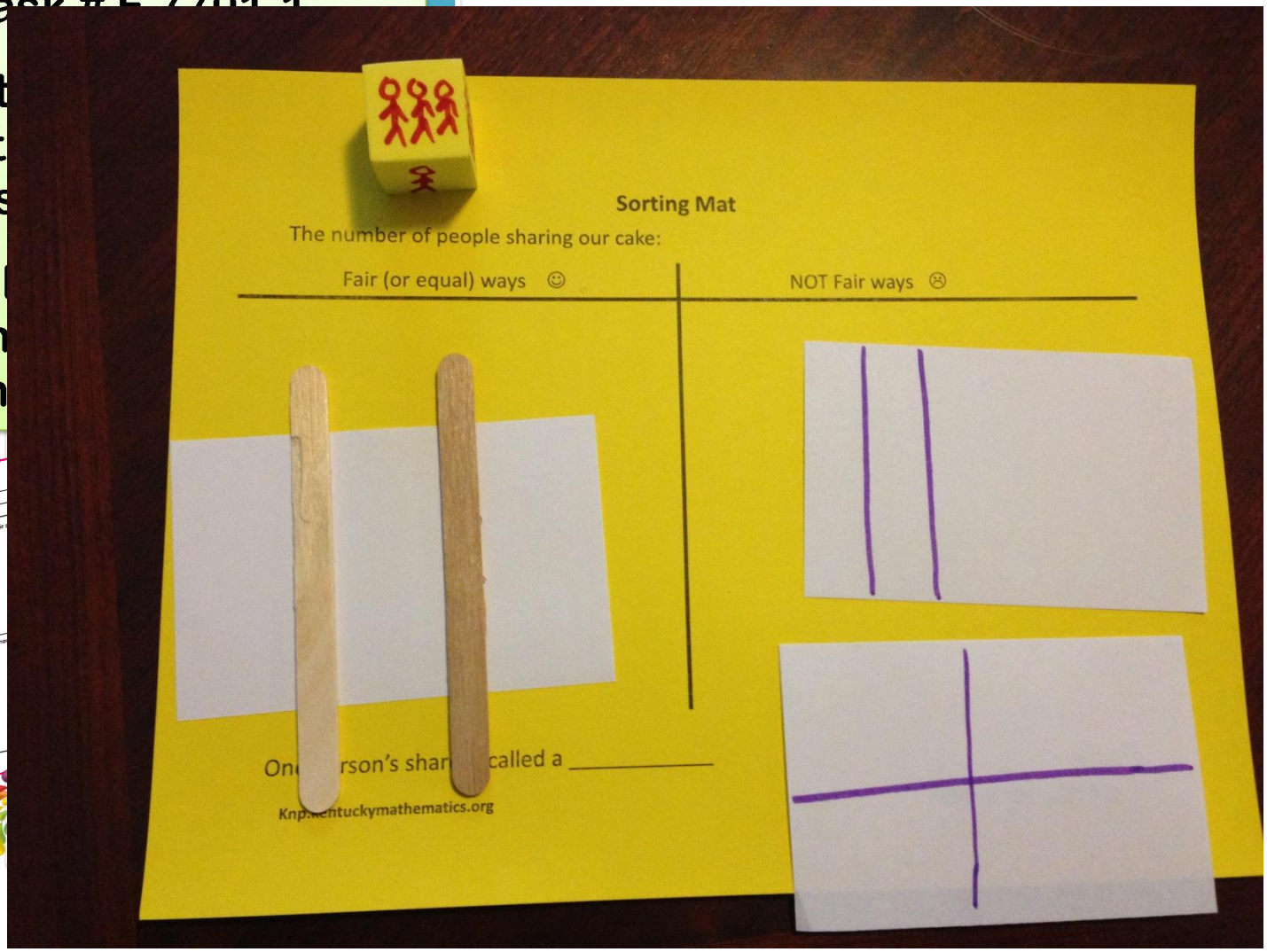
Lesson
Instruction
available th





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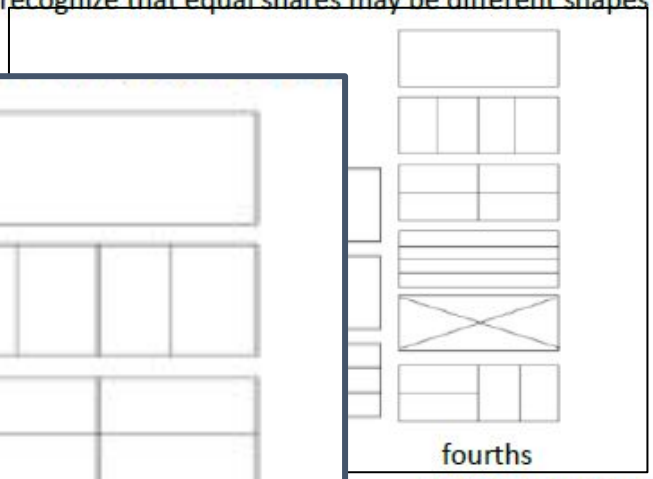
Explore a variety of ways to partition shapes

KY.2.G.3 Partition circles and rectangles into two, three, or four equal shares; describe the shares using the words *halves*, *thirds*, *half of*, *a third of*, etc.; and describe the whole as two halves, three thirds, four

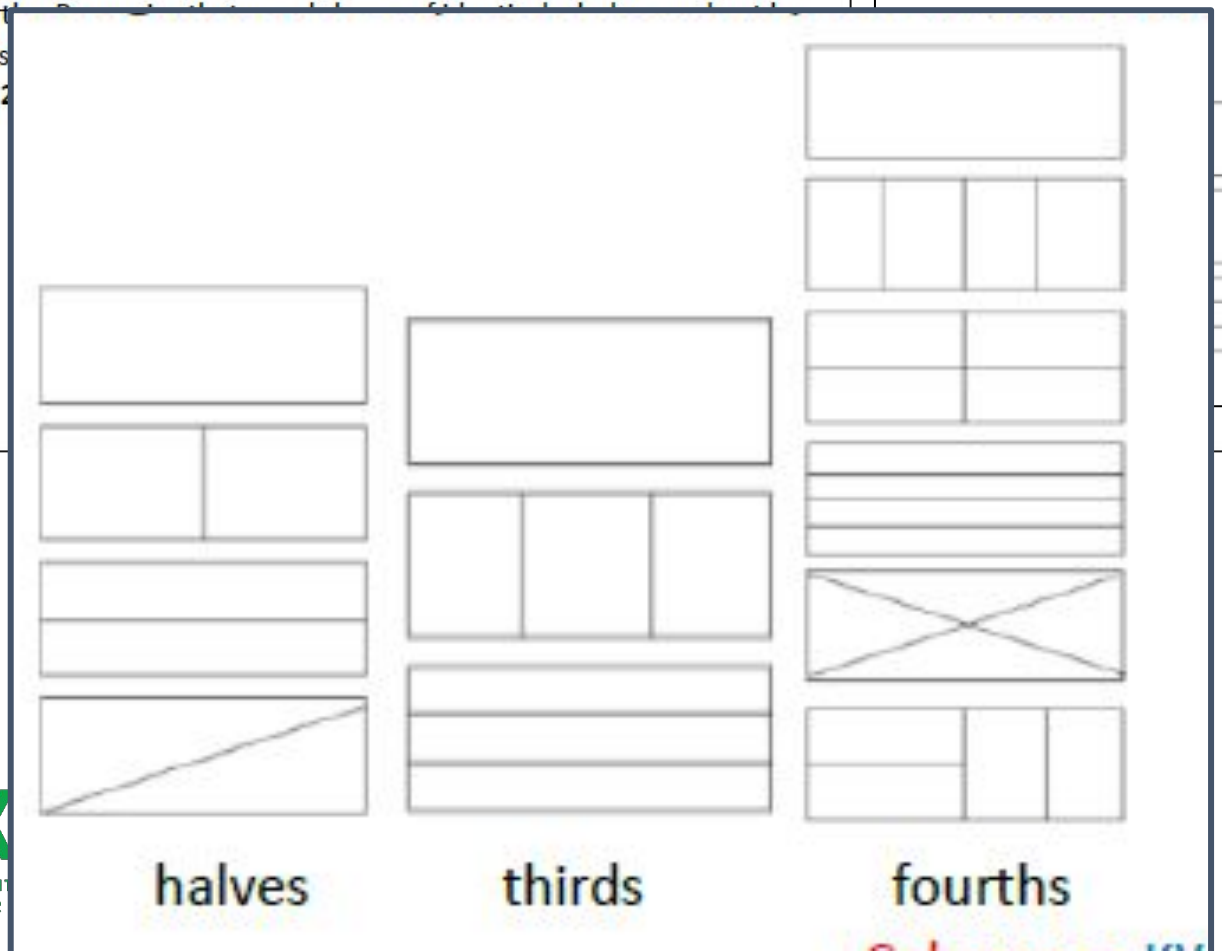
the s

MP.2

Students explore rectangles and circles being partitioned in multiple ways to recognize that equal shares may be different shapes within the same whole.



Coherence KY.1.G.3→KY.2.G.3→KY.3.NF.1



Big Ideas

Students should have experience with CREATING the partitions

- Students should be attending to the SIZE of the parts.
- Students will typically find it easiest to make halves, followed by fourths, then thirds.
- Shapes can be partitioned in a variety of ways.
- Students should initially describe the partitions using words rather than symbols.

Moving into 3rd grade

KY.3.G.2 Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. **MP.2, M.5**	Partitioned parts should be halves, thirds, fourths, sixths, eighths. Students partition a shape into 6 parts with equal areas and describe the area of each part as $\frac{1}{6}$ of the area of the shape. KY.3.NF.1 Coherence KY.2.G.3→KY.3.G.2

- Build on prior work with halves, thirds and fourths by extending to sixths and eighths
- Extend ot a variety of shapes
- Extend to symbolic notation

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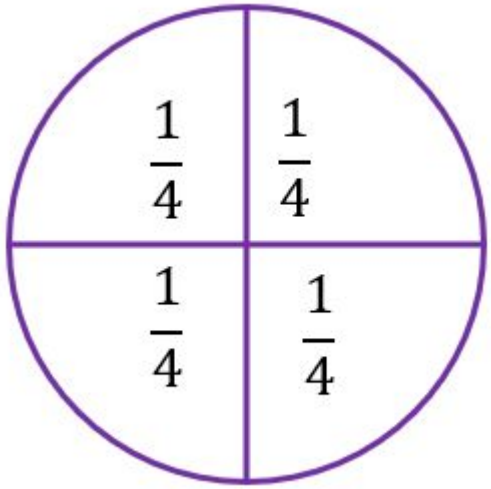
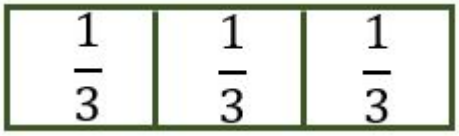
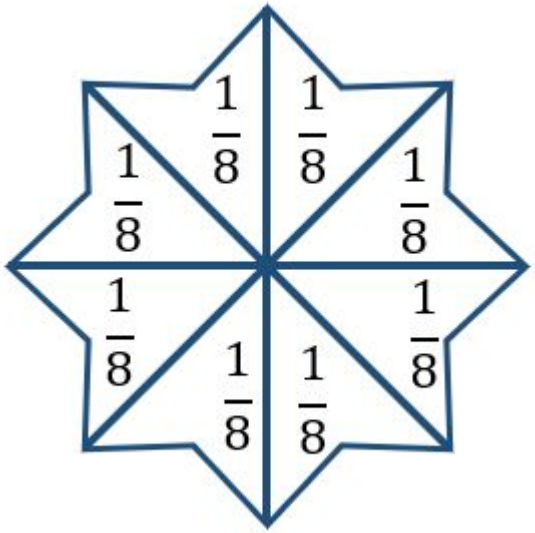
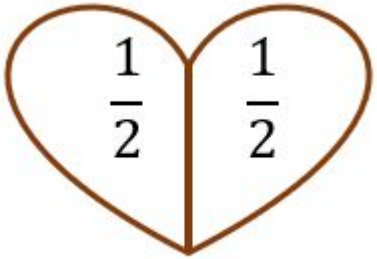
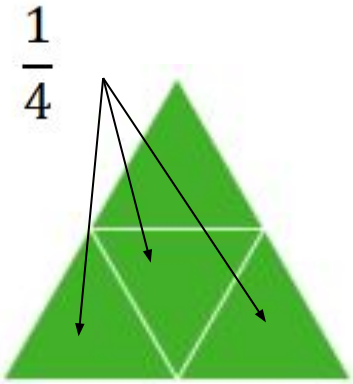
Partitioning Shapes

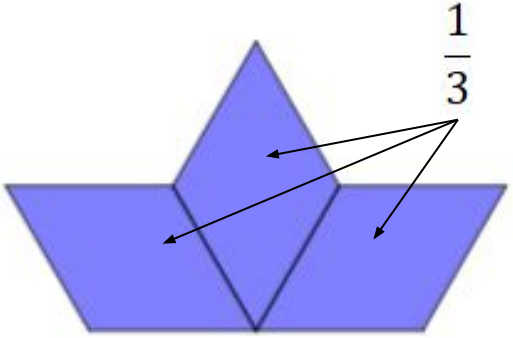












Pattern Blocks

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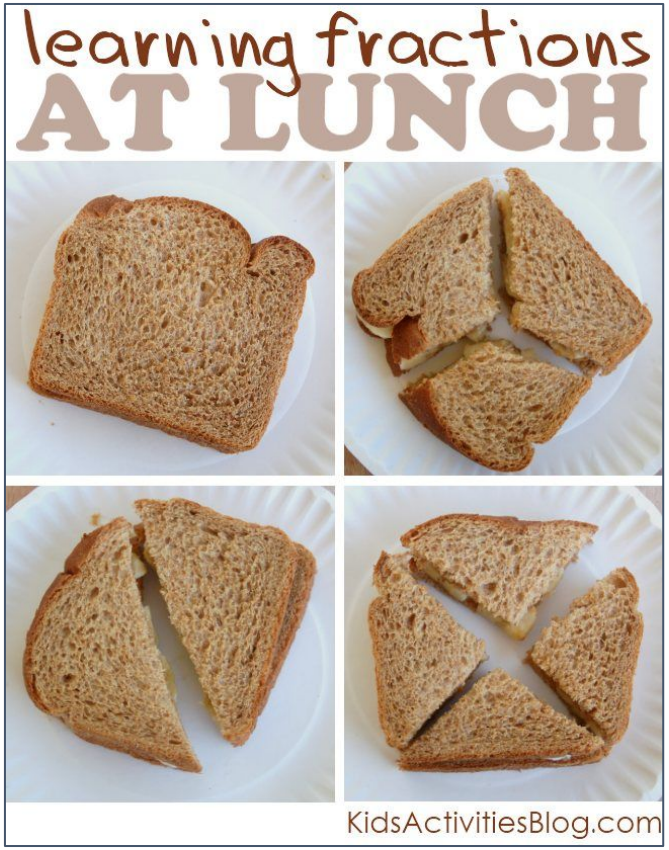
More fractions



https://kidsactivitiesblog.com/25808/math-fractions/

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Moving into 3rd grade

KY.3.NF.1 Understand a fraction $\frac{1}{b}$ as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction $\frac{a}{b}$ as the quantity formed by a parts of size $\frac{1}{b}$. **MP.2, MP.7**	Students name parts of the whole using fractions and explain the fraction is made up of unit fractions. Students describe the numerator and the denominator using pictures, numbers and words. $\frac{4}{6} = \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6}$ Note: grade 3 expectations in this domain are limited to fractions with denominators 2, 3, 4, 6 and 8. Coherence KY.2.G.3→KY.3.NF.1→ KY.4.NF.3

- Understand a fraction $\frac{1}{b}$ as the quantity formed by 1 part when a whole is partitioned into b equal parts.

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KY.3.NF.1 Continued

KY.3.NF.1 Understand a fraction $\frac{1}{b}$ as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction $\frac{a}{b}$ as the quantity formed by a parts of size $\frac{1}{b}$. **MP.2, MP.7**	Students name parts of the whole using fractions and explain the fraction is made up of unit fractions. Students describe the numerator and the denominator using pictures, numbers and words. $\frac{4}{6} = \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6}$ Note: grade 3 expectations in this domain are limited to fractions with denominators 2, 3, 4, 6 and 8. Coherence KY.2.G.3→KY.3.NF.1→ KY.4.NF.3

- Understand a fraction $\frac{a}{b}$ as the quantity formed by a parts of size $\frac{1}{b}$.

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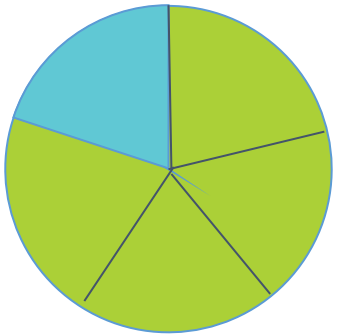
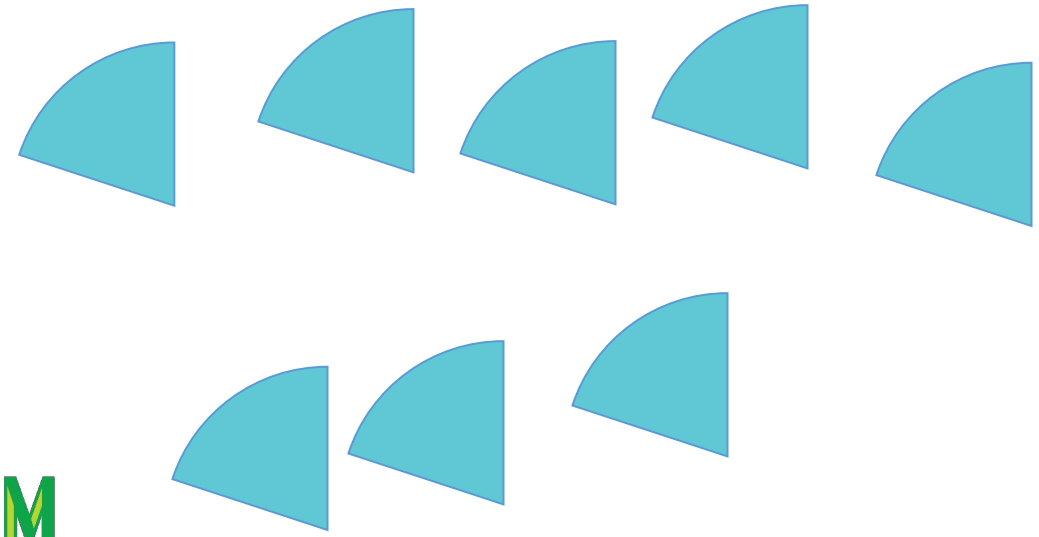
Counting with Unit Fractions



The circle is one unit.

The size of the blue piece is $\frac{1}{5}$



8-fifths

$\frac{8}{5}$

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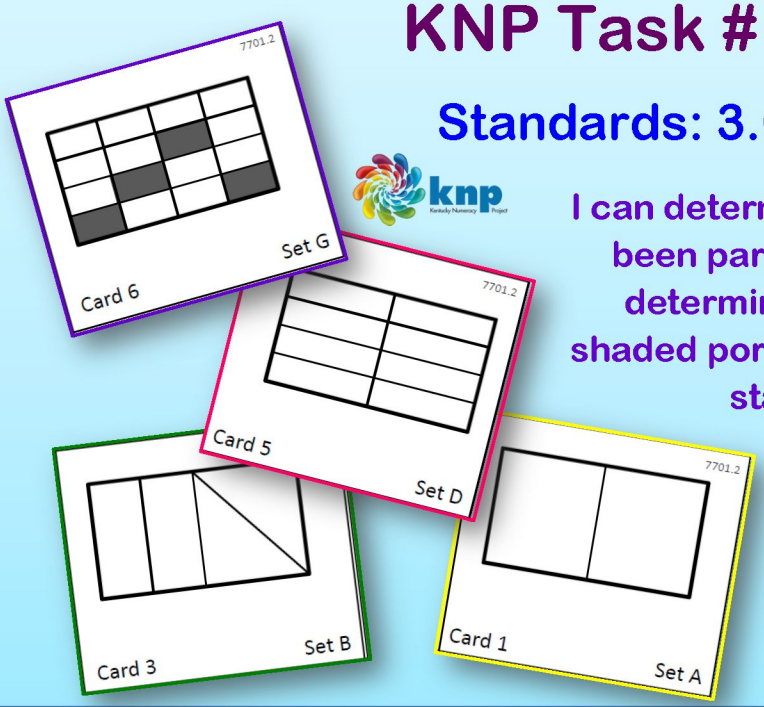
Units

- Add 6 teddy bears + 2 teddy bears
- Add 6 (ones) + 2 (ones)
- Add 6 tens + 2 tens
- Add 6 hundreds + 2 hundreds
- Add 6 thirds + 2 thirds
- Add 6 tenths + 2 tenths
- Add $6x + 2x$

Fraction Squares-Is it Fair?

KNP Task # F 7701.2

Standards: 3.G.2, 2.G.3



I can determine if a rectangle has been partitioned fairly. I can determine whether or not a shaded portion of a rectangle is a stated amount.

Materials needed: Fraction Sort Cards sets A through H, Sorting Board, Answer Cards

Print version:
http://knp.kentuckymathematics.org/knp/landings.php?act_id=7701.2&prefix=F

Virtual Version:
https://www.kentuckymathematics.org/vr_fractions.php#frac-8

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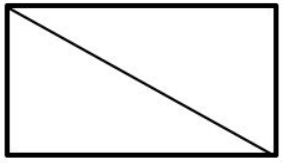
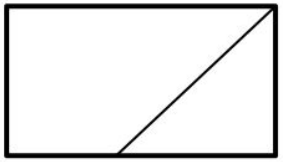
Rule Card - Set A	
Cards that show halves	Cards that do NOT show halves

knp.kentuckymathematics.org

KNP # F 7701.2

7701.2  Card 1 Set A	7701.2  Card 2 Set A	7701.2  Card 3 Set A
7701.2  Card 4 Set A	7701.2  Card 5 Set A	7701.2  Card 6 Set A

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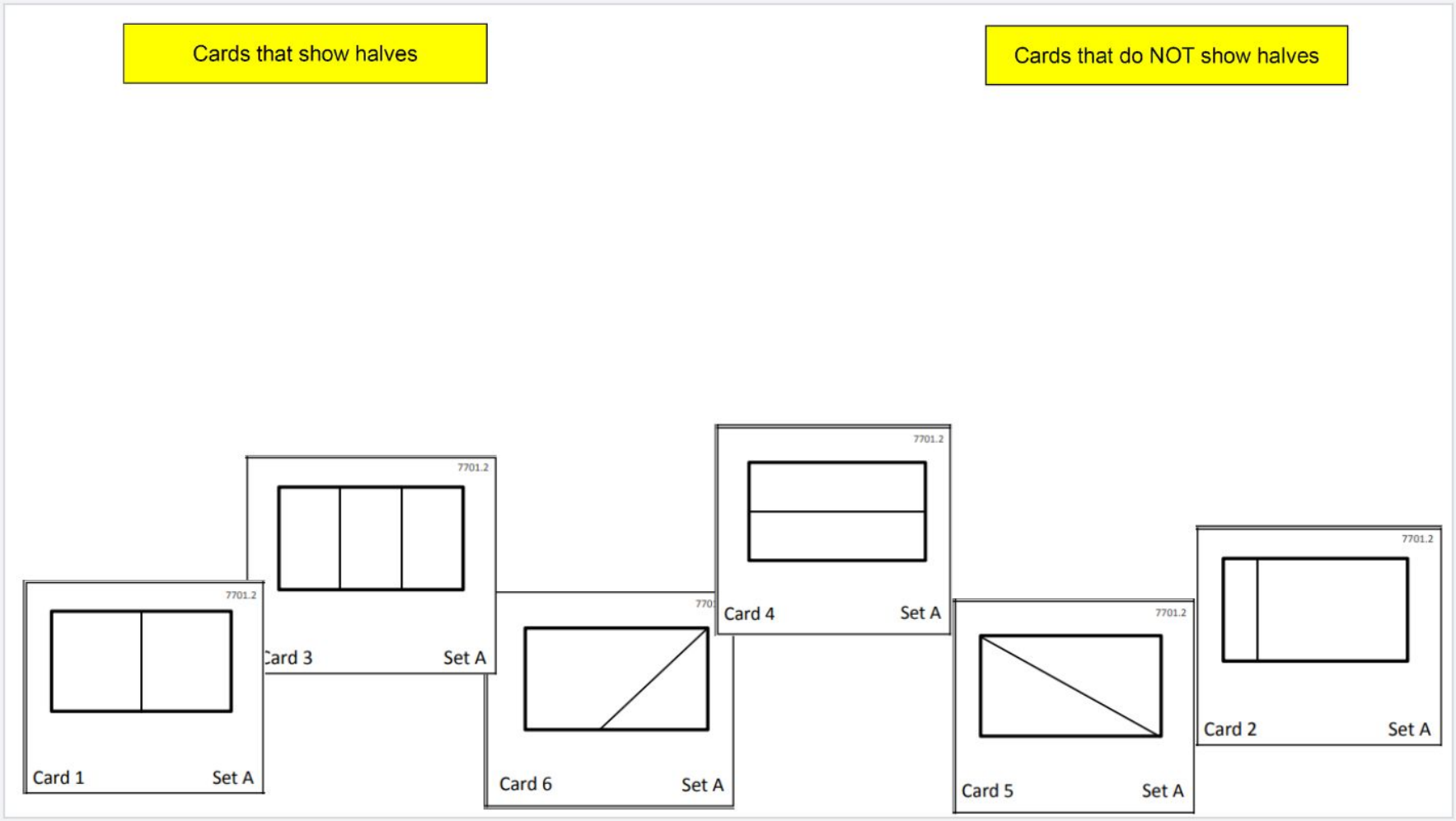
Jam Board Virtual Sort

LINK: https://jamboard.google.com/d/1RofZ0ulXsdiiVfk-b7vfbFWCFpKg6i3ssNZ8yHzLesg/viewer?f=0



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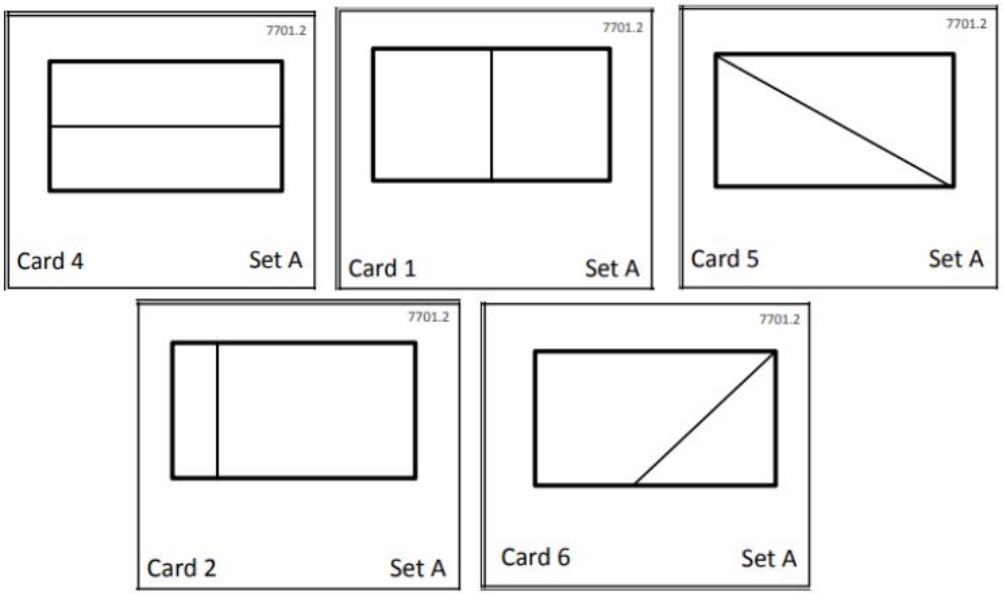
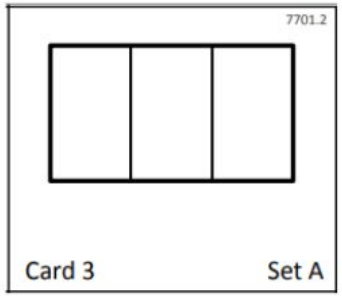
Cards that show halves



Cards that do NOT show halves



- What does this student understand about halves?
- What does this student not understand about halves?
- What might you ask or say to this student?

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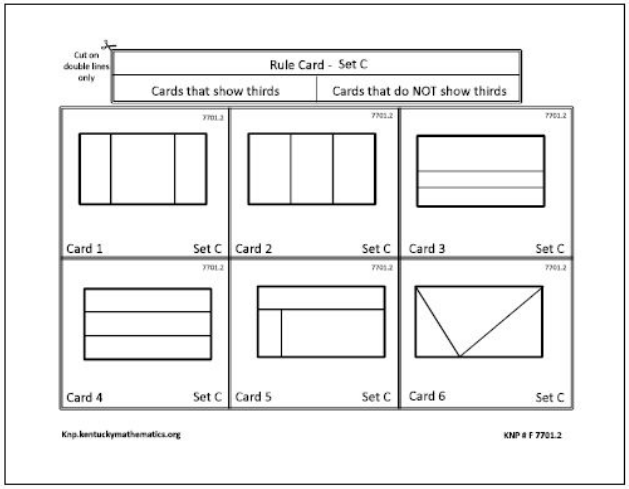
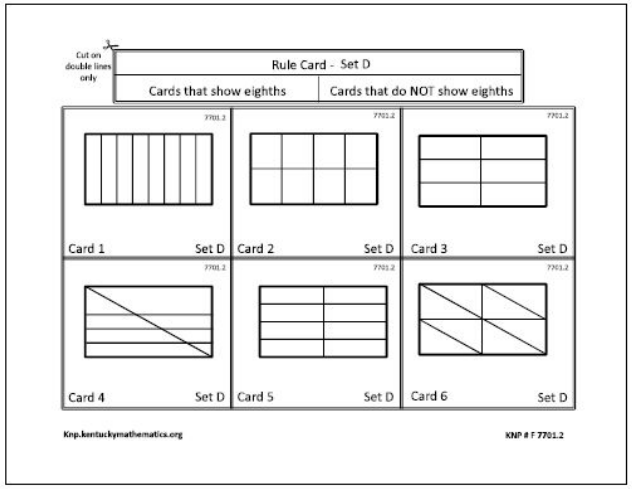
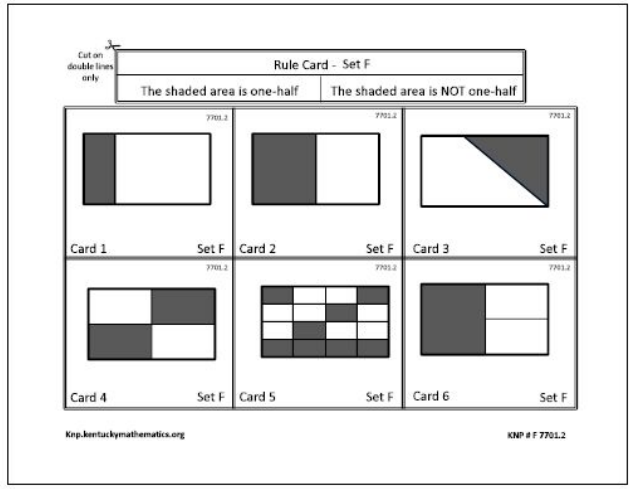
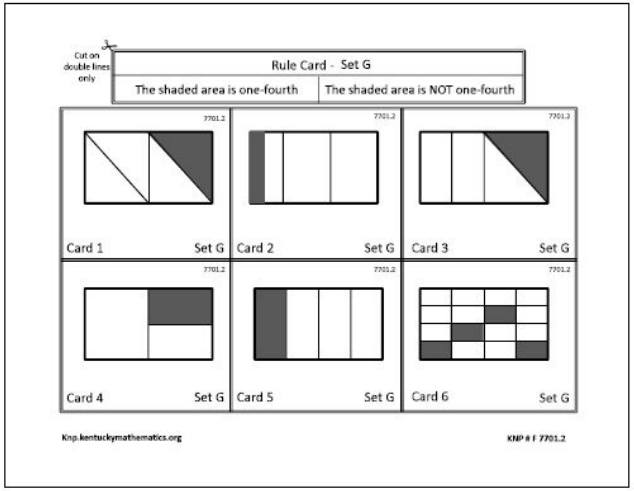
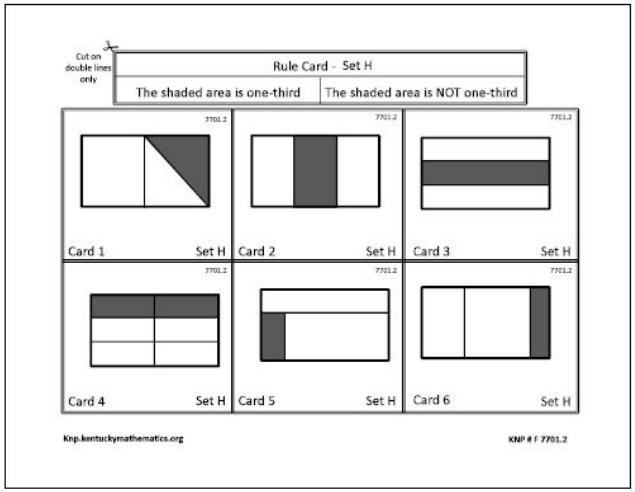
Examples of additional sort sets

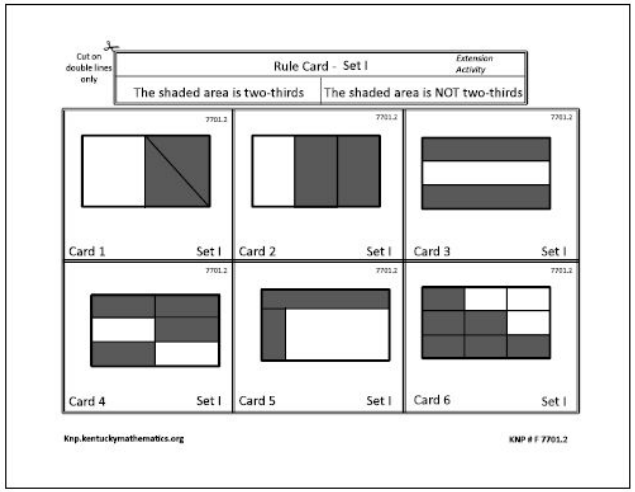




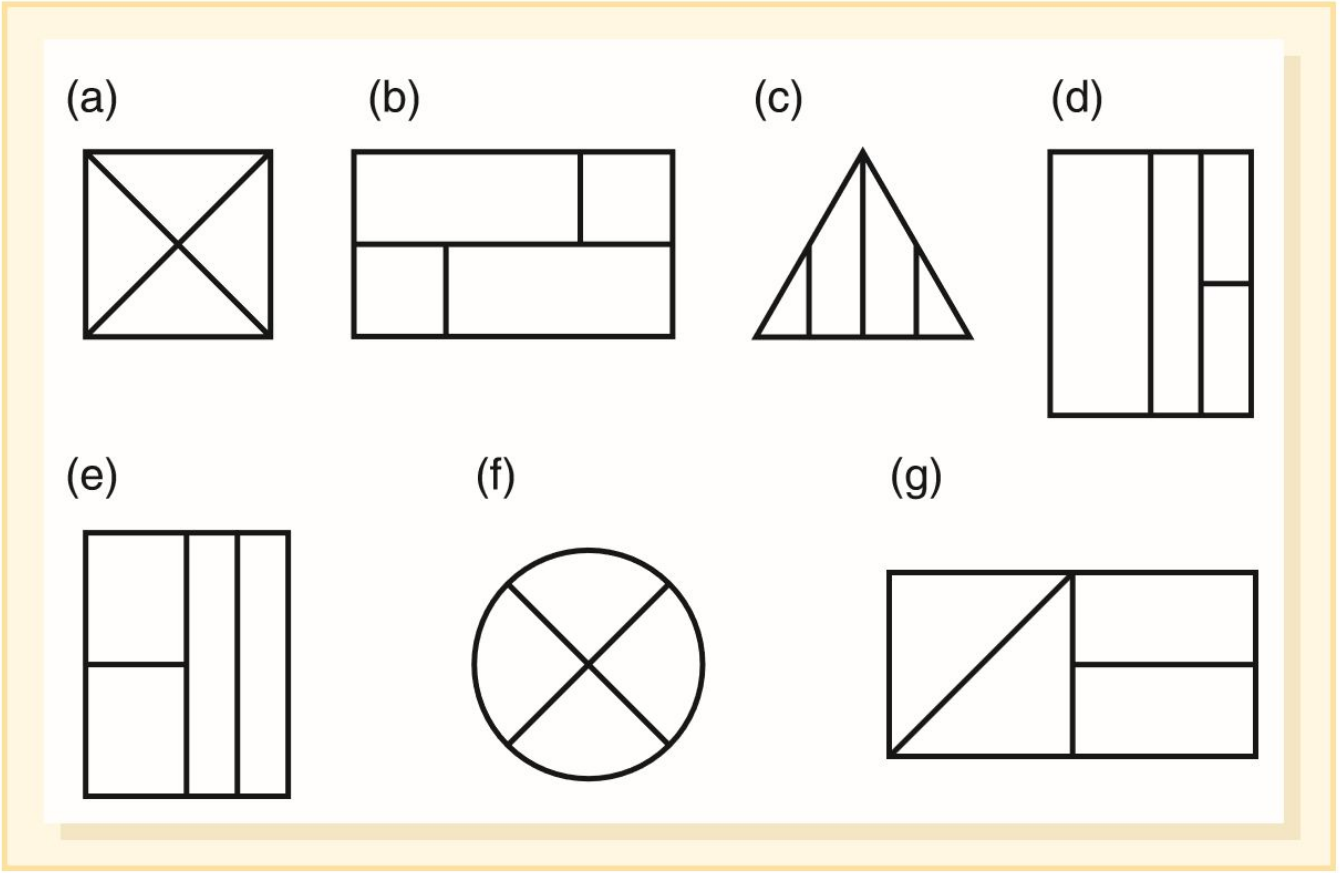








Which figures are correctly partitioned in fourths? Why (and why not)?



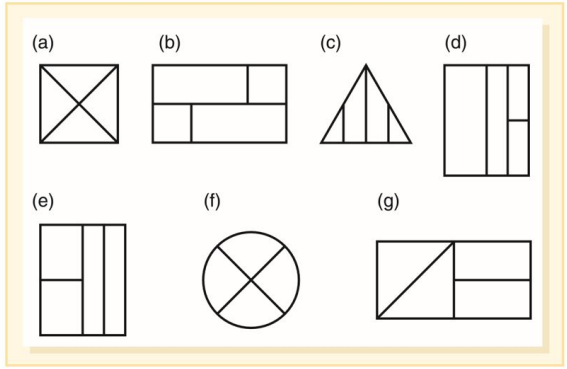
[Teaching Student Centered Mathematics Volume II, 2017 edition, page 228]

Link to Jam Board:

https://jamboard.google.com/d/1pYgvwbyLhAhszfmPlpfAc05uSINpFvbT5ROxvPDlopw/copy

Handout version

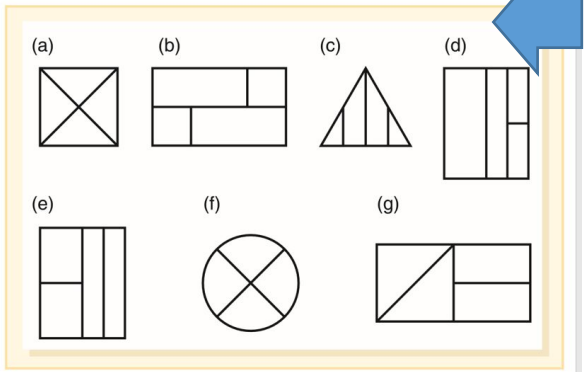
Which figures show fourths?
Explain why or why not for each figure.



a) ☐ yes ☐ no _____
b) ☐ yes ☐ no _____
c) ☐ yes ☐ no _____
d) ☐ yes ☐ no _____
e) ☐ yes ☐ no _____
f) ☐ yes ☐ no _____
g) ☐ yes ☐ no _____

Teaching Student-Centered Mathematics Volume III, 2014 edition, page 110, Figure 8.1

Which figures show fourths?
Explain why or why not for each figure.



a) ☐ yes ☐ no _____
b) ☐ yes ☐ no _____
c) ☐ yes ☐ no _____
d) ☐ yes ☐ no _____
e) ☐ yes ☐ no _____
f) ☐ yes ☐ no _____
g) ☐ yes ☐ no _____

Teaching Student-Centered Mathematics Volume III, 2014 edition, page 110, Figure 8.1

Teaching Student Centered Mathematics Volume II, 2017 edition, page 228

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What Fractions Do You See?

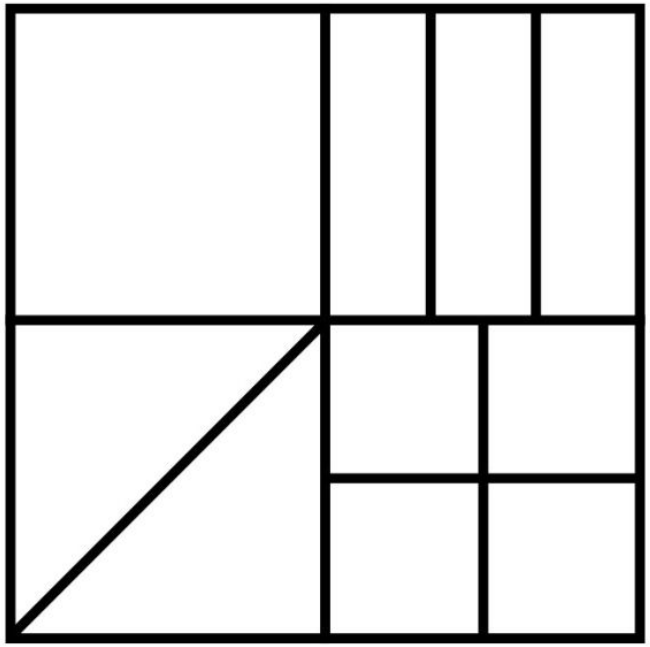

Figure From
Uncomplicating Fractions

TAPINTOTEENMINDS.COM

@MATHLETEPEARCE

Link: https://tapintoteenminds.com/3act-math/cover-it-up/
Image from Uncomplicating Fractions by Marian Small

Link to Jam Board: https://jamboard.google.com/d/1-Wy6iszuAjkTnsirnxuFS3_Bmztm_rvd79uXMQIDpKw/copy

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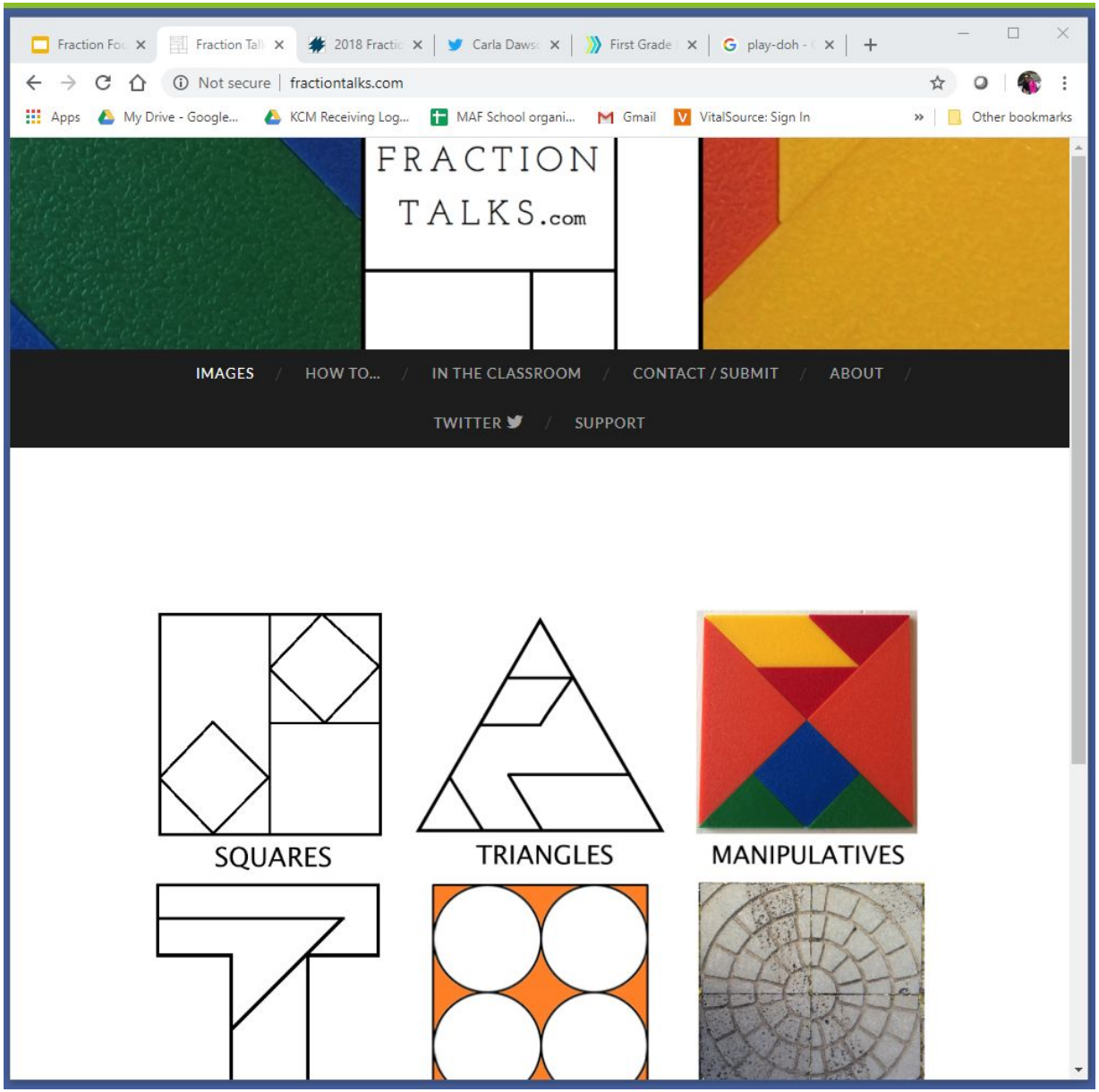
http://fractiontalks.com/



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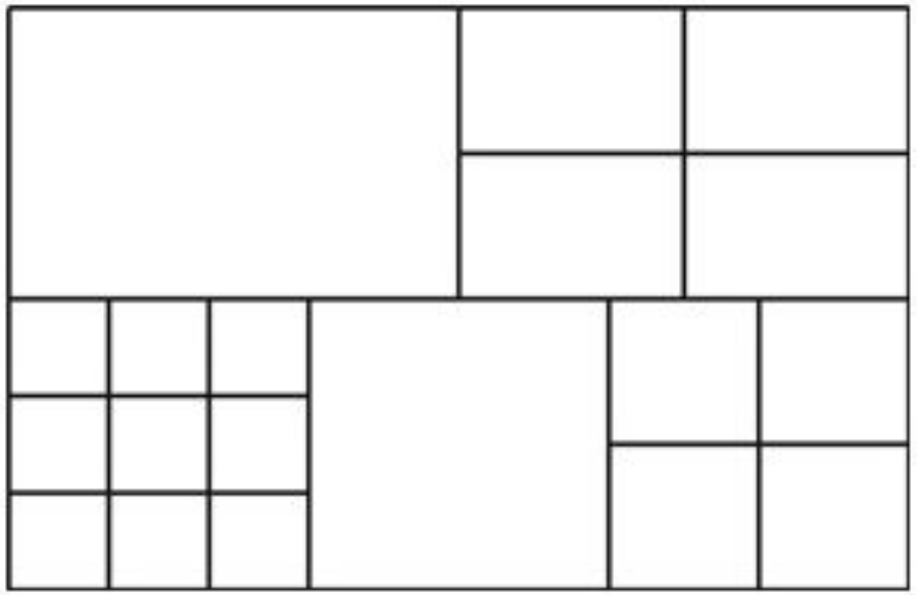
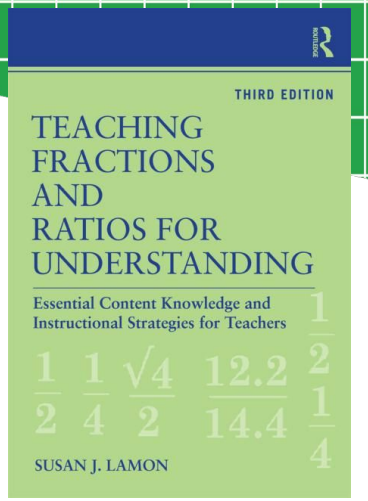
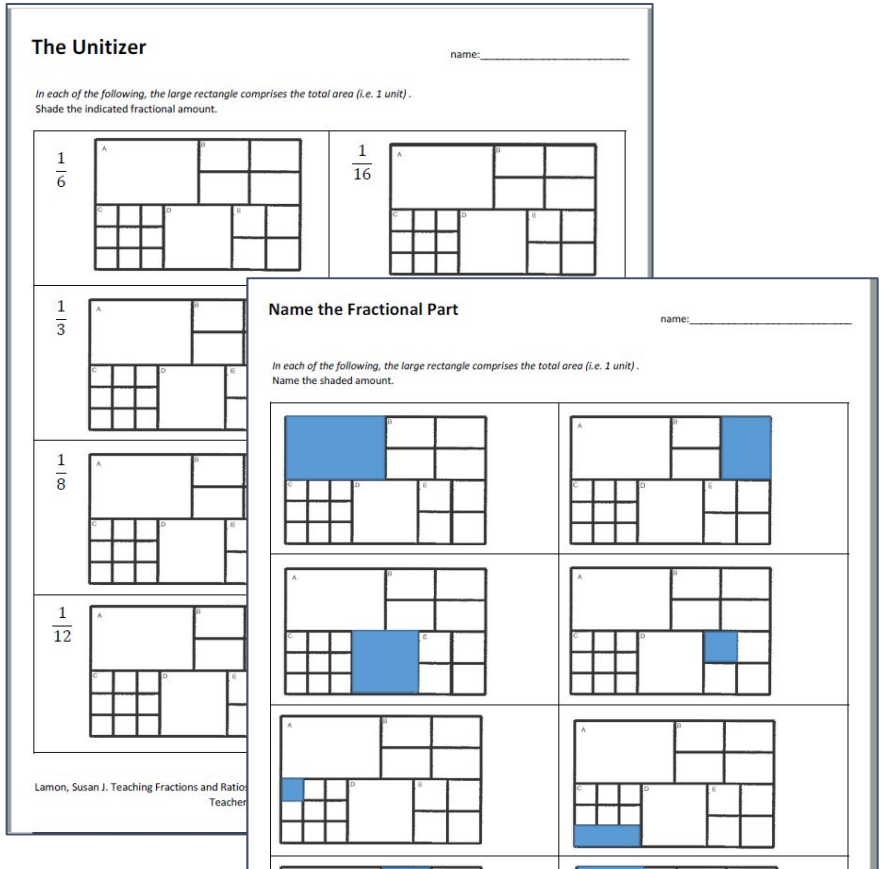
The Unitizer







PDF version:
https://drive.google.com/file/d/1WCq49LOtFAxe8HHQcX92KGjh93Jz3bma/view?usp=sharing

Desmos version:
https://teacher.desmos.com/activitybuilder/custom/601899f5b3aa1b3fb75ce704

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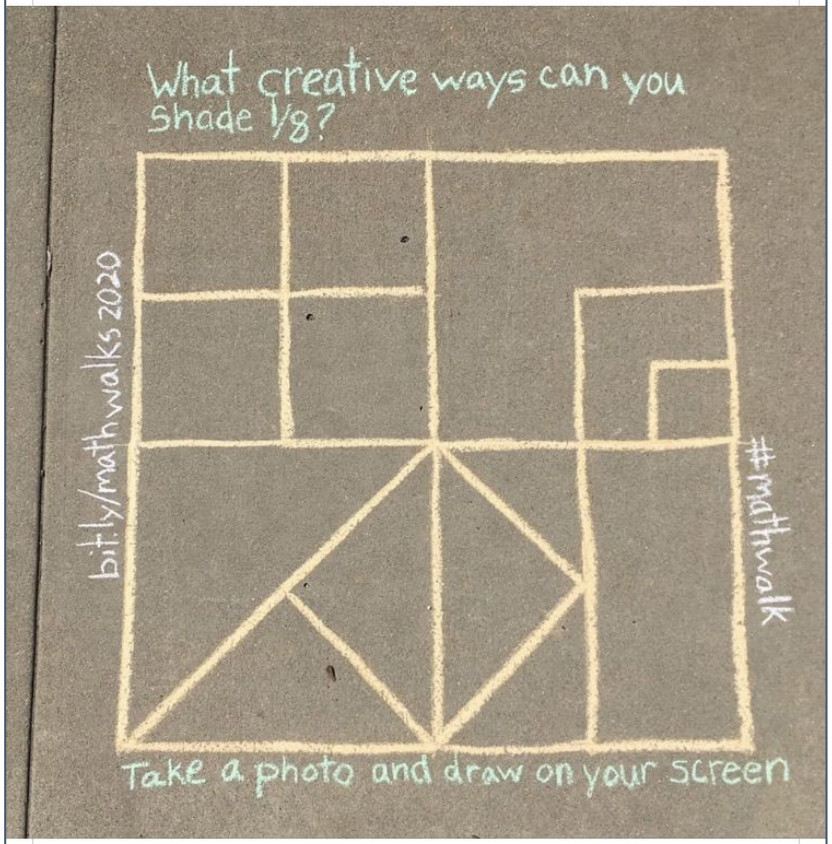
Traci Fikstad Jackson ▸ Low Floor, High Ceiling Mathematics

2 hrs ·

During my Math Walk today I heard, "I do your games every day" and "Thank you for the fun." I love mat... See More



142 11 Comments 41 Shares

MathWalks Link:
https://sites.google.com/powayusd.com/math-walks/home

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Link to Jam Board:
https://jamboard.google.com/d/1Mybwd46JOKBjdSlMRNzsj8jLOCNiwoNGB75iOJZ6Fto/viewer

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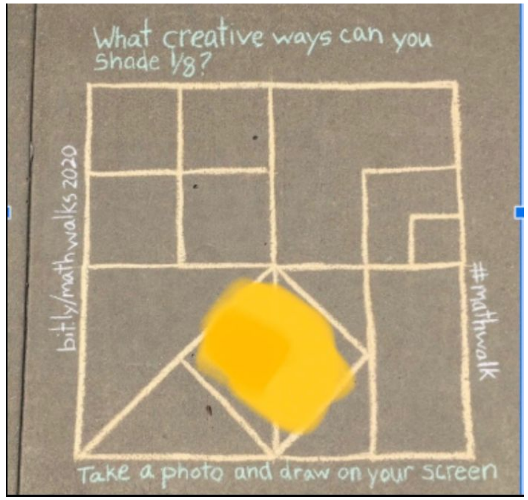
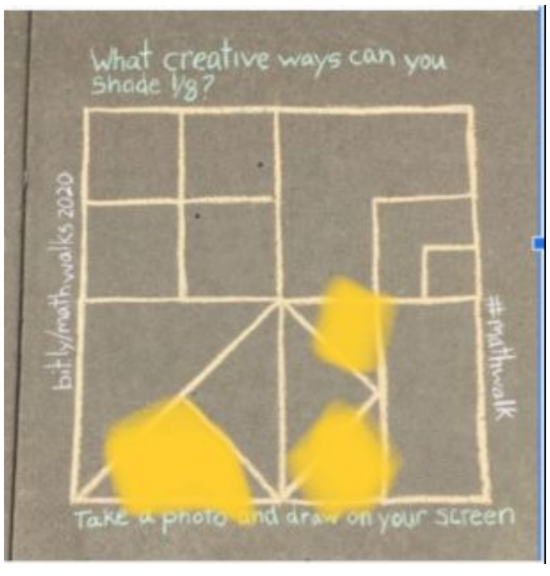
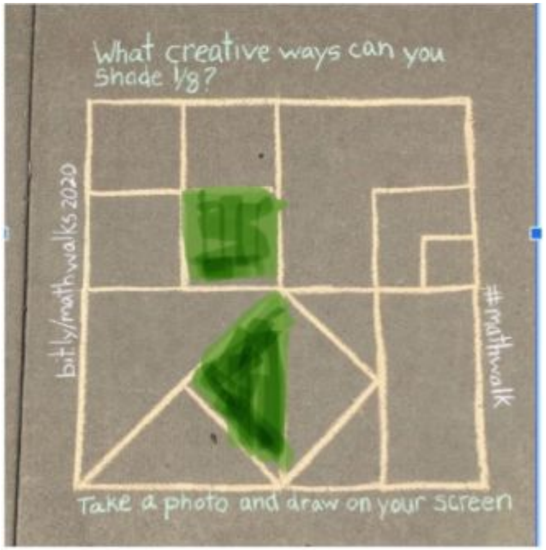
Ways to show 1/8







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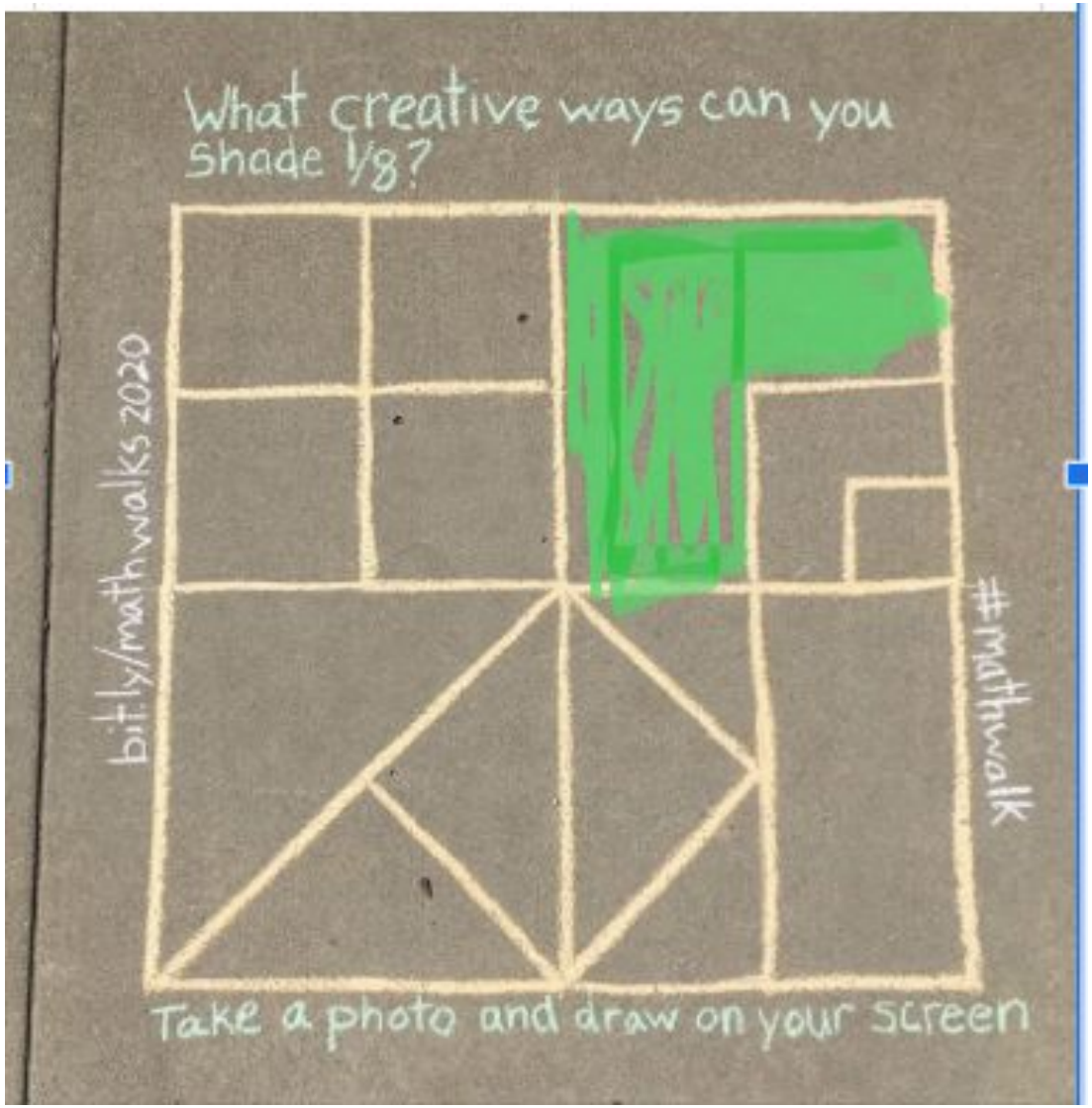
Extend to other fractions



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Handout Packet

Focus on Fractions: Fractions Foundations

May 4, 2020

https://www.kentuckymathematics.org/kcm_virtual.php

IES Practice Guide: Developing Effective Fractions Instructions for Kindergarten through 8th Grade

https://ies.ed.gov/ncee/wwc/Docs/PracticeGuide/fractions_pg_09

First Grade Kate – Blog in which a first grade teacher discusses using pl
halves and fourths.

https://www.firstgradekate.com/2014/01/hands-on-fractions-using

KNP IG entry Fraction Squares: I can Share (F7701.1)

Teacher Guide, Instruction page and Black Line Masters:
http://knp.kentuckymathematics.org/knp/landings.php?act_id=770

KNP IG Entry Fraction Squares: Is it Fair (F7701.2)

Teacher Guide, Instruction page and Black Line Masters:
http://knp.kentuckymathematics.org/knp/landings.php?act_id=770

Interactive JamBoard: https://jamboard.google.com/d/1RofZ0ulXs
b7vfbFWCFpKg6i3ssNZ8yHzLesg/viewer?f=0

Is it Fourths? Jamboard:

https://jamboard.google.com/d/152tE6ISIPS09EACz1VIUlt1QAuJ
ewer

"What fractions do you see?" and other interesting visuals for exploring fr

Interactive JamBoard
https://jamboard.google.com/d/1Mybwd46JOKBjdSIMRNzsj8jLO
viewer

Blog: https://tapintoteenminds.com/3act-math/cover-it-up/

Interactive JamBoard
https://jamboard.google.com/d/1Mybwd46JOKBjdSIMRNzsj8jLO
viewer

MathWalks: https://sites.google.com/powayusd.com/math-walks/

Fraction Squares - I can share!

I can partition rectangles to make two, three or four equal shares.

KNP # F 7701.1 - Fraction Squares - I can share!, Red
Fluency Standard: 2.FFF
Standard: 3.G.2, 2.G.3, 1.G.3,

Materials: Paper cut outs of rectangles (including squares), sorting mat
(1 per group), recording sheet (at
(showing 2 to 4 stick figures on c
straight edge and/or popsicle stic

Directions:

1. Get a sorting mat and enough paper cut-o
have at least two. (You may need to cut ther

2. Player 1 rolls the people cube. This is hov

3. Each player, using one pretend cake, will
the entire cake fairly. Player may use popsic
side of the Sorting Mat. (If a player accident
can place it on the "Not Fair" side.)

4. Each player, using another pretend cake,
Place it on the Not Fair side of the Sorting M

5. Take turns to explain WHY each cake is
players agree.

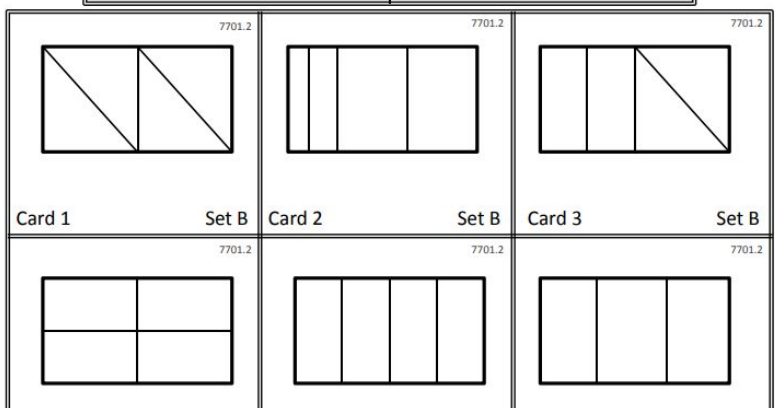
6. Name the size of **one** person's share if the

7. Repeat steps 1 through 6, with a new play
MAY be used.

8. After 3 rounds, EACH player completes
on the third round.

Cut on double lines only

Rule Card - Set B	
Cards that show fourths	Cards that do NOT show fourths



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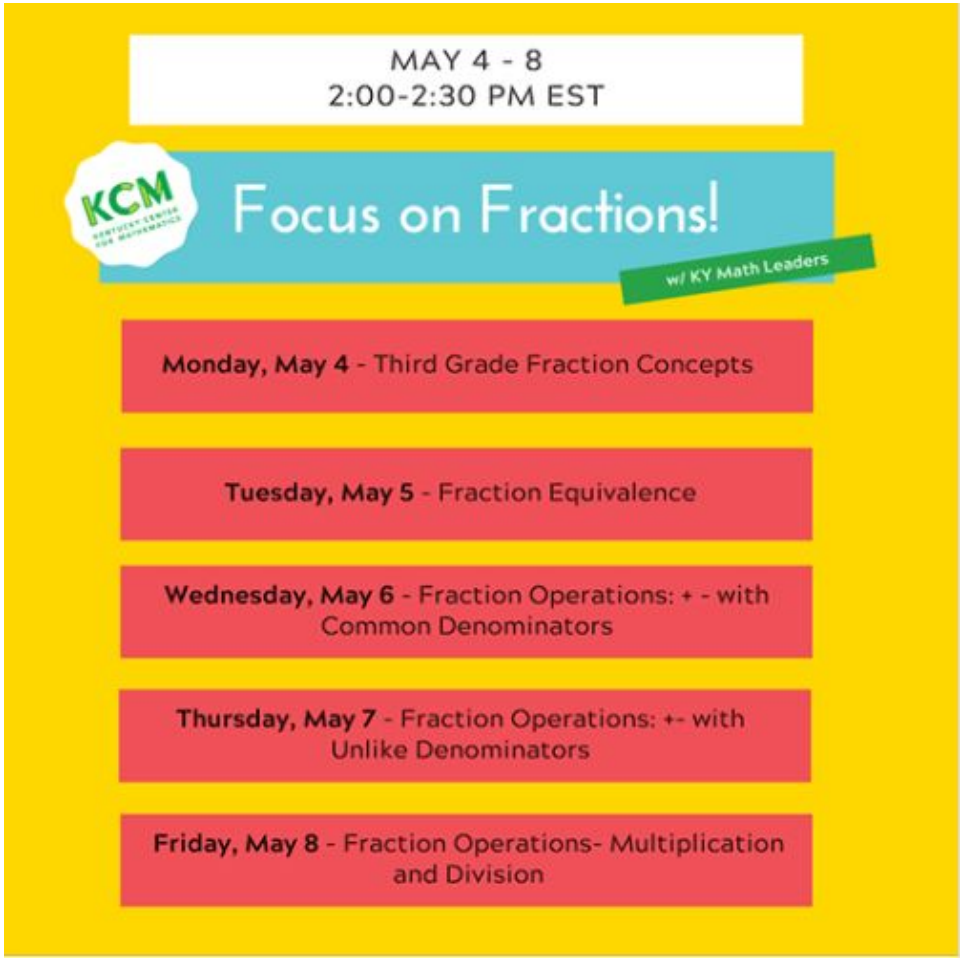
Upcoming This Week



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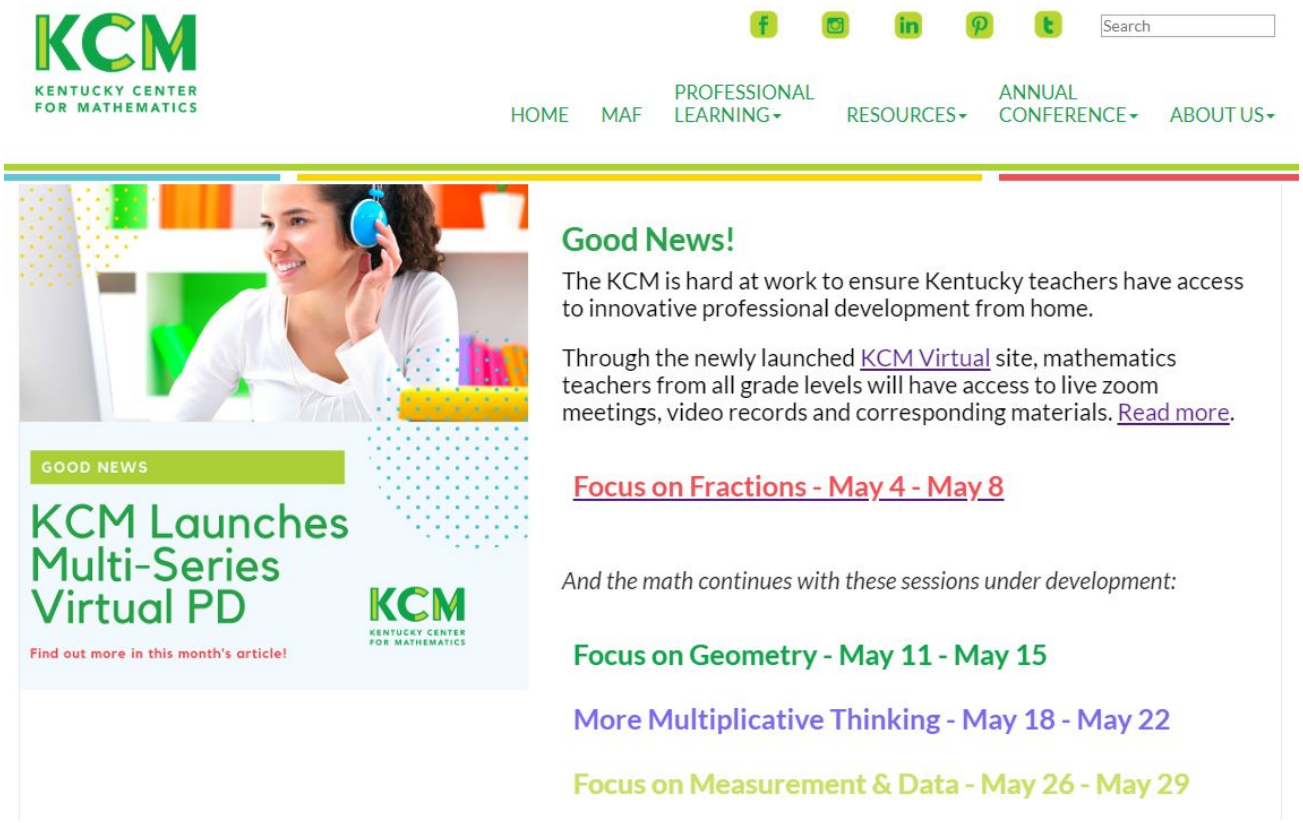
Follow Us!

www.kentuckymathematics.org



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KCM is here to support you!

Contact me:

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Regional Consultant
Kentucky Center for Mathematics
cindy.aossey@outlook.com

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