FOR ACCESS TO ALL DOCUMENTS

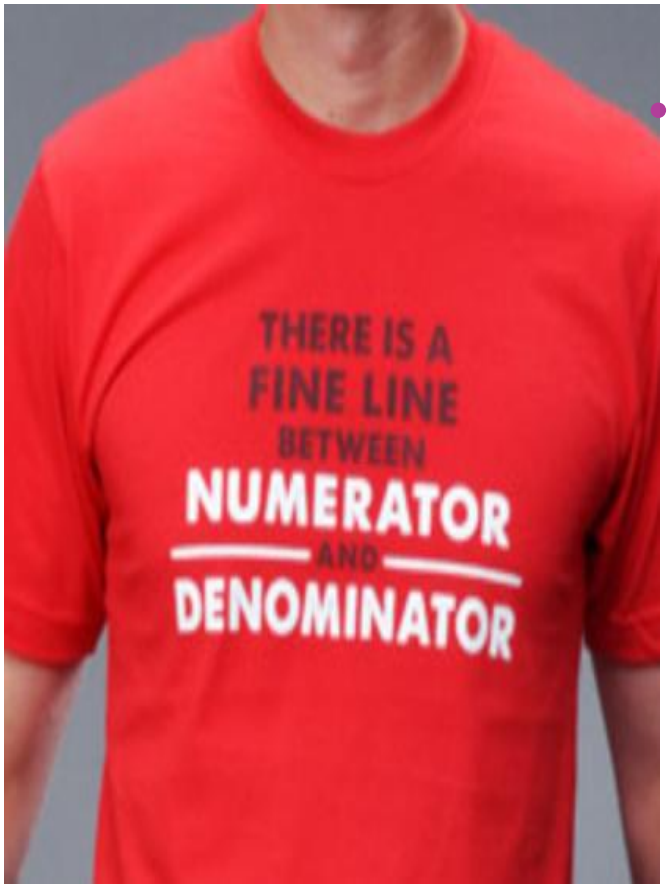
If you would like access to a dropbox folder with the documents we used during our session, please email me at either

mathematicalmama@hotmail.com

or JoannBarnett@missouristate.edu

You should be able to adapt these documents to your needs. Several of the documents are lesson plans related to the activities we used.

THINKING ABOUT FRACTIONS
HELPING THE ½'S AND THE 1/2-NOTS



- **As you come in the room:**
- **On the lime Welcome paper describe:**
  - **The purpose of the numerator and the denominator**
  - **Some key ideas you want students to know about the relationship between the two**

Then try to get the lid of the play-do ☺

THINKING ABOUT FRACTIONS

HELPING THE HALVES AND THE HALF-NOTS

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Clinton Public Schools

Clinton, Mo

JOANN BARNETT
EMILY COMBS

- $\frac{2}{5}$ Of the letters in my first name is a preposition.
- $\frac{4}{5}$ Of my first name is a standard unit of measurement.

MEANINGFUL REPRESENTATION

- **What does work:**

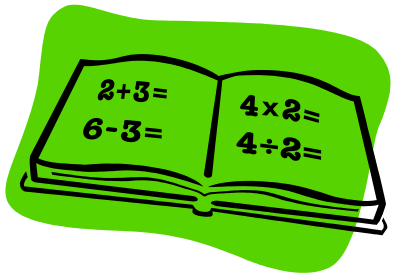
Focus on solution strategies and thinking

Teachers are guides and moderators

- **What does not work:**

Focus on right / wrong answers and mechanical application of rules

Teachers are dispensers of algorithms and answers



-Developing Number Sense in the Middle Grades, NCTM Addenda Series/ Grades 5-8

WHY THIS CONTENT IS IMPORTANT

We view fractions as a key point in the pathway from arithmetic to algebra.

OVERLY AMBITIOUS AGENDA

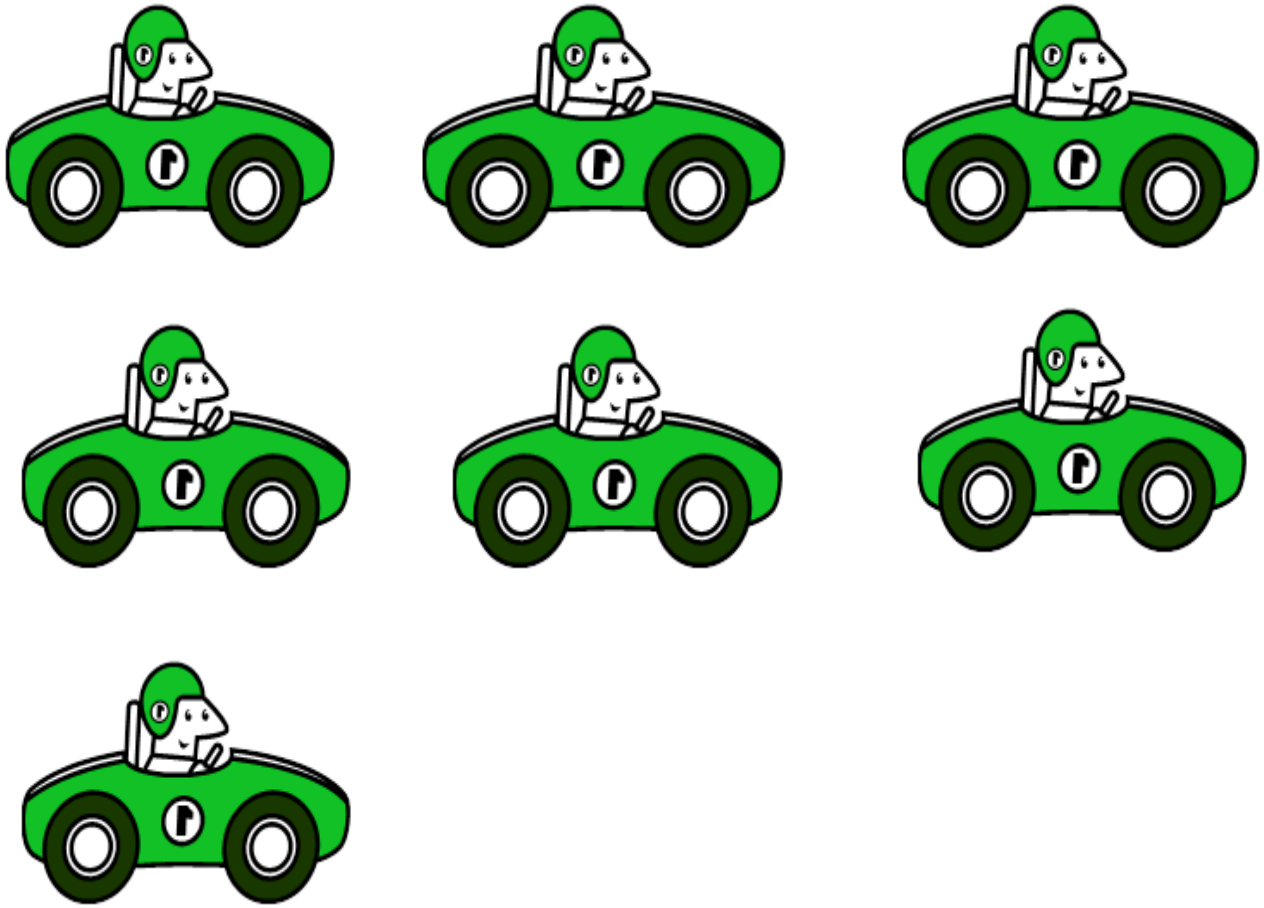
- Transition from Whole Number to Fraction Notation(30)
- Folding Fraction Strips
  - Marking the Number Line
  - Where Is One?
  - How Far Did She Walk?
- Come on Six…Fraction Style
- Intro to Cuisenaire Rods
  - Cuisenaire Rods Comparing One
- Whole Number to Fraction/Fraction to Whole Number
- Making Equivalent Fractions
  - I Have Who Has
- Some operations?

TRANSITION FROM WHOLE NUMBER TO FRACTION NOTATION

- *Kindergarten*

- *When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.*

COUNTING RACECARS

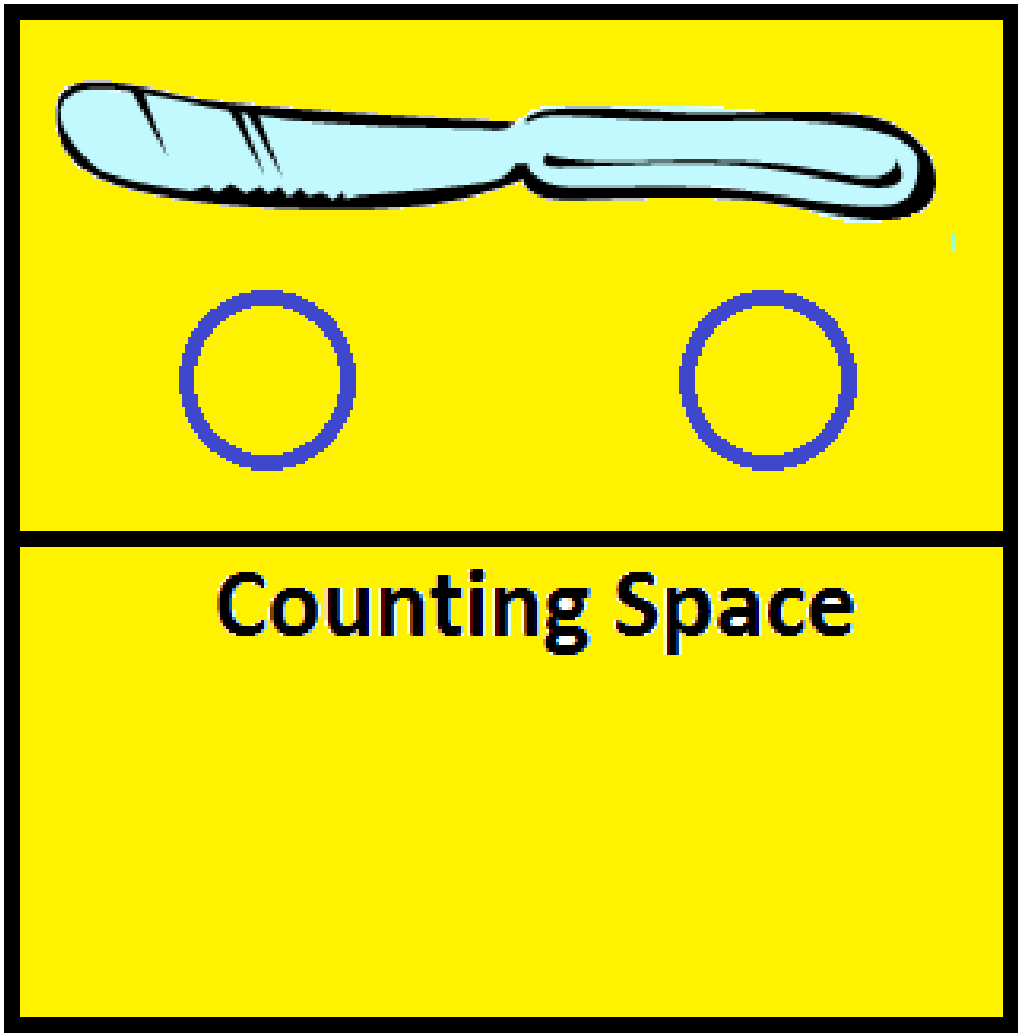


Transition from Whole Number to Fraction Notation

•Grade 1
Partition and describe two and four equal shares of circles and rectangles …recognize that decomposing into more equal shares created similar figures

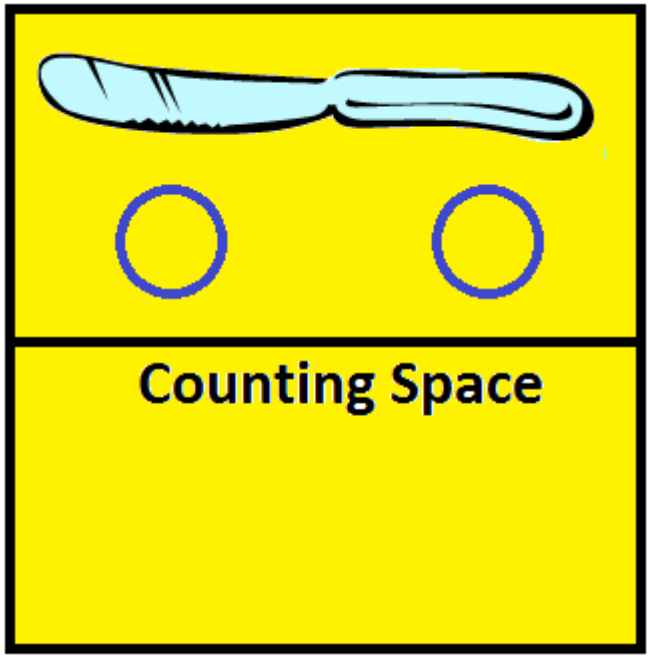
Grade 2
•Partition and describe two, three or four equal shares of circles and rectangles, …recognize that equal shares of identical wholes need not have the same shape

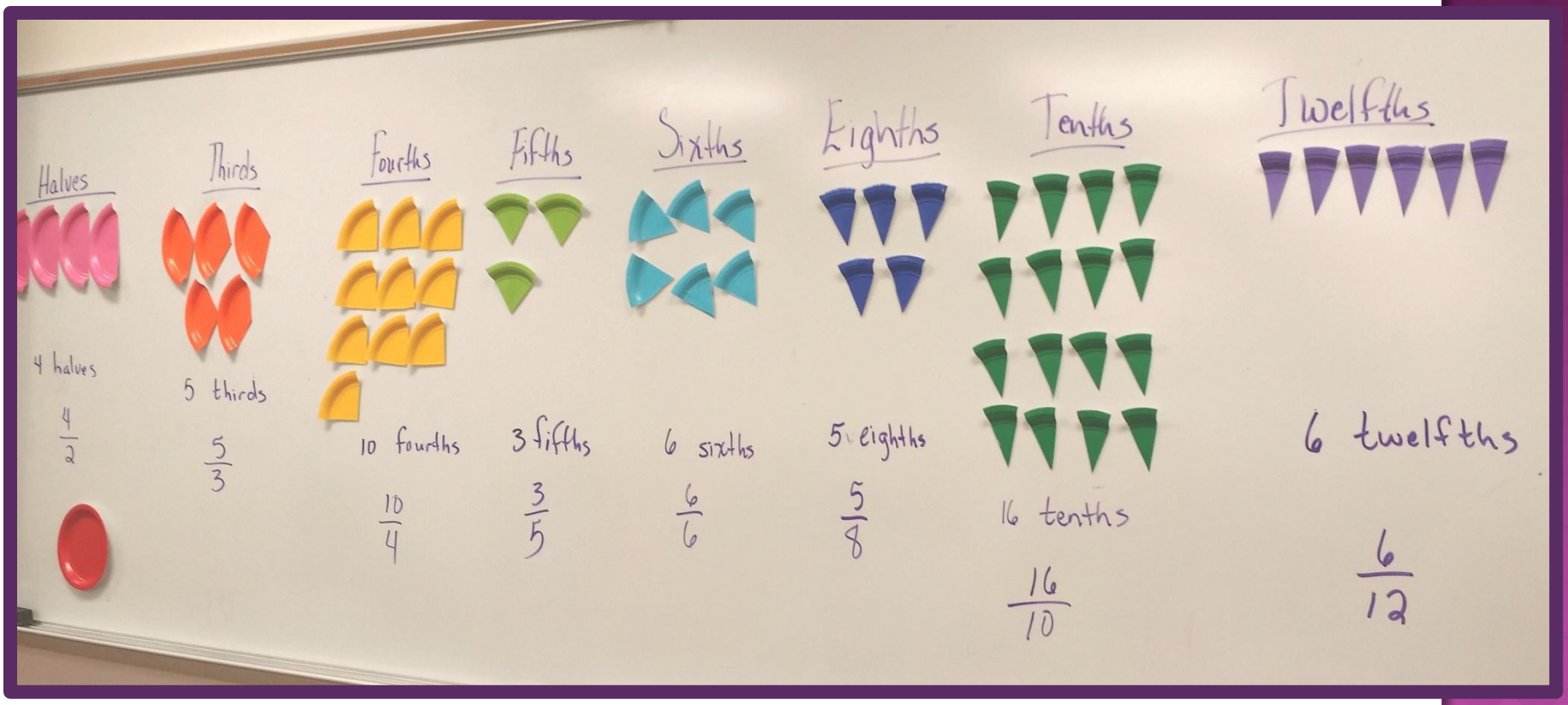
MAKE YOUR PLACEMAT



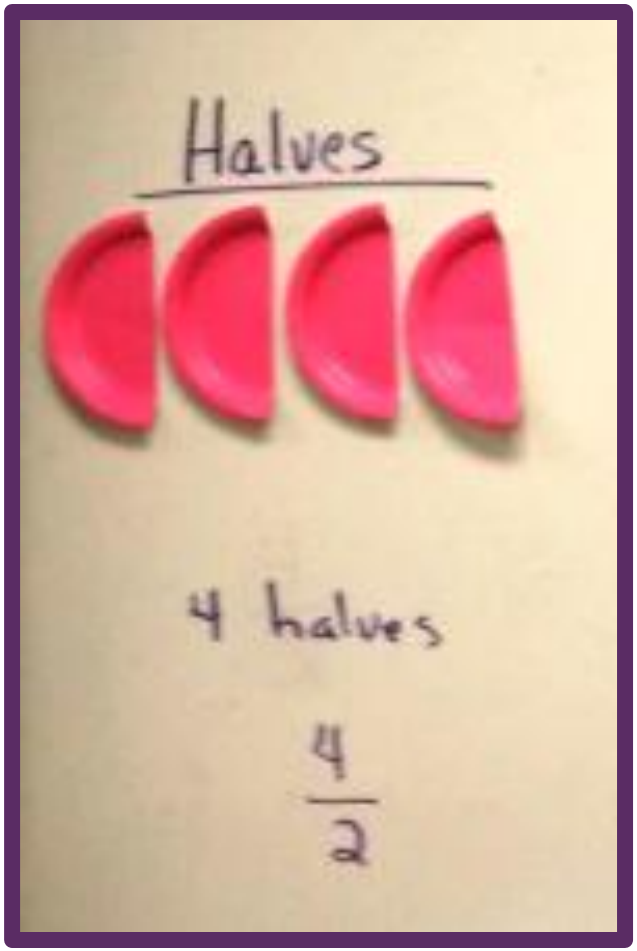
TRANSITION FROM WHOLE NUMBER TO FRACTION NOTATION

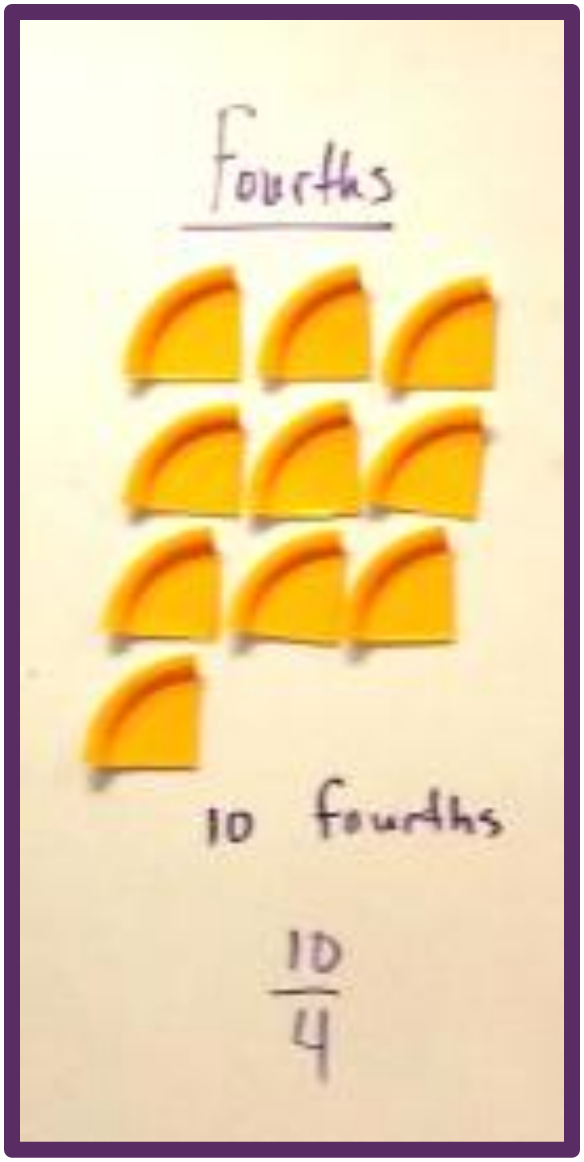
- Partition the play-do into 2 equal size cookies
- Now let's count




Halves
4 halves
4/2
Thirds
5 thirds
5/3
Fourths
10 fourths
10/4
Fifths
3 fifths
3/5
Sixths
6 sixths
6/6
Eighths
5 eighths
5/8
Tenths
16 tenths
16/10
Twelfths
6 twelfths
6/12

QUESTIONS TO ASK





QUESTIONS TO ASK

What do you need to make 1 whole?

QUESTIONS TO ASK

- Why are we able to make two whole circles with $\frac{4}{2}$,

yet we couldn't even make 1 whole circle with $\frac{6}{12}$?

MORE QUESTIONS

- How can $\frac{5}{3}$ be equal to more than 1 circle while $\frac{5}{8}$ is less than 1 whole circle?

Questions to Ask

- What does it mean when the count is greater than what is being counted?

QUESTIONS TO ASK

- How does the count relate to what's being counted when the amount is less than 1 whole circle? Exactly 1 whole circle? More than 1 whole circle? More than 2 whole circles?

I'M THINKING OF A NUMBER...

- I'm thinking of one of the numbers I've written here today.
- This number is different than all the others in a special way.
- Even the picture that we made with the paper plates looks different than all the other pictures.
- In your journal, record what you think my number is and why you think that's my number.

QUESTIONS TO ASK

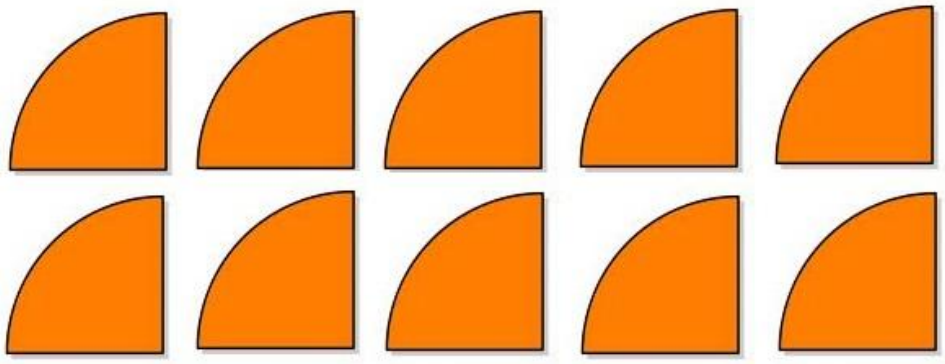
- **Look at all the 6's in the two numbers below:**

$$\frac{6}{6} \qquad \frac{6}{12}$$

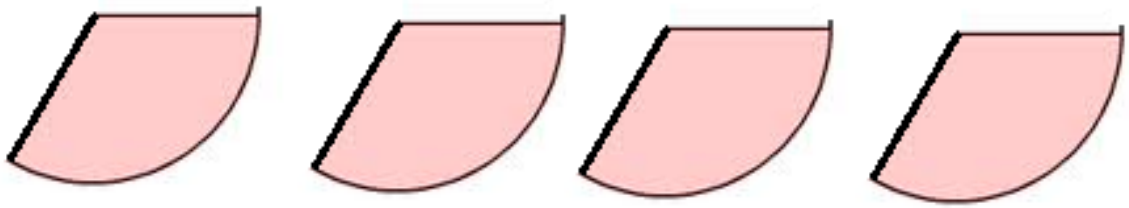
What does each 6 indicate, and why do the circle pieces look so different for the two numbers?

MORE QUESTIONS

- Place enough circles to make half of a circle for each color that you can.
- How does the count compare to what you are counting if you only count up to half of a circle?
- Why can’t you make half of a circle with thirds and fifths?



$\frac{10}{4}$



$4\frac{1}{3}$

$4\frac{1}{8}$

Adjusting the Fraction Definition

- **Basically:**
  - **the top number is the count**
  - **the bottom number is what you are counting**

- Activity adapted from John Van de Walle's "Teaching Student-Centered Mathematics, Grade 3-5." Pearson Education, 2006. Pages 138-140.

- Leave a more official definition for numerator and denominator for another class period after student's have had some experience with the notation and the purpose of each number.

- **….mixed numbers serve as "colloquial" ways of expressing quantities; however, when push-comes-to-shove and mathematical operations must be performed, they are dead weight.**
  - Kate Thompson from an article on The Mathematics Teaching Community website

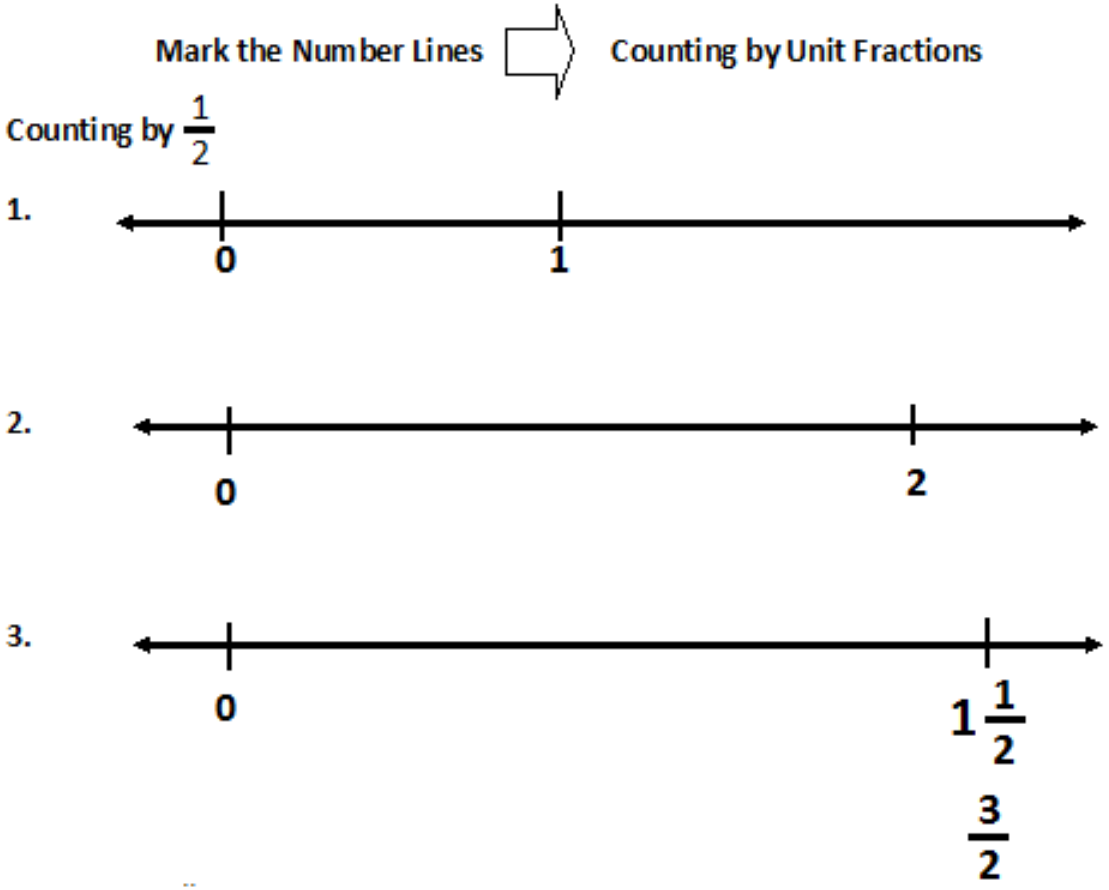
FOLDING FRACTION STRIPS

- Whole Unit: Red
- Halves: Pink
- Thirds: Orange
- Fourths: Yellow
- Fifths: Lime
- Sixths: Light Blue
- Eighths: Dark Blue
- Ninths: Lavender
- Tenths: Dark Green
- Twelfths: Lavender

3.NF.1

- **Understand a fraction 1/*d* *as the quantity formed by 1* part when a whole is partitioned into *d equal parts;***
- ***Understand* a fraction *n/d as the quantity formed by a parts of size 1/d.***

COUNTING ON THE NUMBER LINE WITH UNIT FRACTIONS

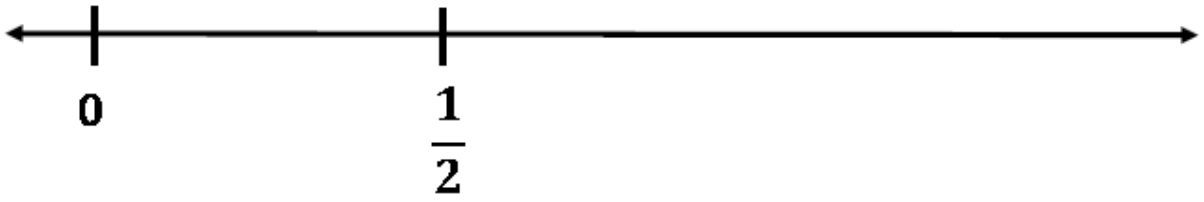


WHERE IS ONE?

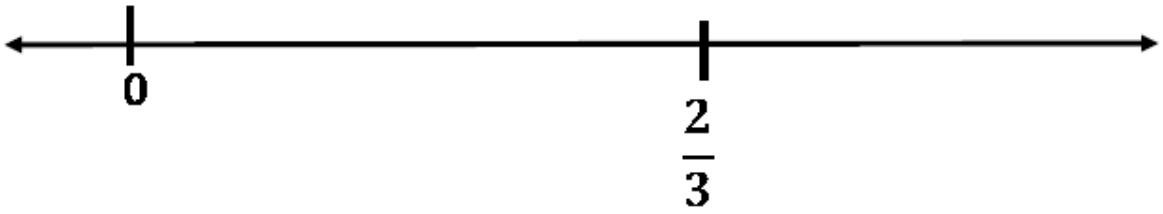
Where is One?

Locate and mark the whole number 1 on each number line. You may fold strips of paper to help you locate the whole number 1.

1.



2.



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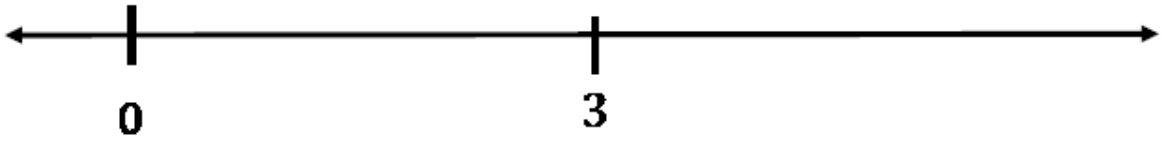


HOW FAR DID SHE WALK?

Name_____

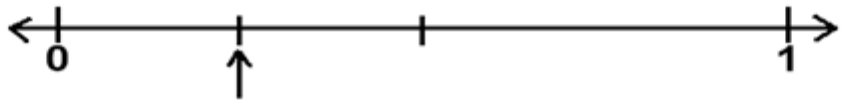
How Far Did She Walk?

- Today Mandy walked her dog from her house to her friend's house.
- Each number line below shows how far Mandy has walked.
- For each number line, write the fraction that shows how far Mandy has walked and explain how you know.

Mandy's House

Friend's House

A.



COME ON SIX

- Fraction style….
- Each person in the group needs handout of 0-2 number lines
- Each group needs 1 pencil
- Each group needs 1 number cube

COME ON SIX

- Take turns rolling the number cube until a person rolls a six.
- The person who rolls a six grabs the pencil, and then counts by halves on the first number line from 0 up to 2. writing each number in the count.
- Then count by thirds on the next number line.
- While this person is counting and writing on the number lines, the other people in the group keep rolling the number cube until one of them rolls a six.
- Whoever rolls a six takes the one pencil from the person and begins writing and counting on their own number lines.
- If a person gets the pencil back, they begin counting and writing where they left off.
- Fifths, Sixths, Sevenths, Eighths, Ninths, Tenths
- Winner!!!!!!!

CUISENAIRE RODS OR RELATIONSHIP RODS

number of units

IF THIS IS ONE

- If the purple rod is 1:
  - What is the value of the brown rod?
  - What is the value of the red rod?
  - What is the value of the white rod?
  - What is the value of the dark green rod?

IF PURPLE IS ONE

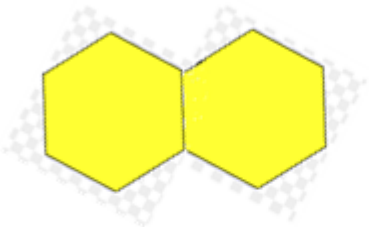
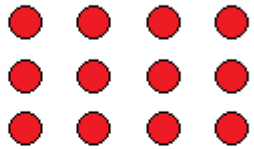
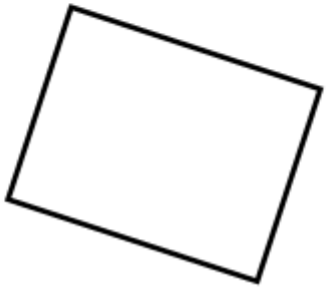
QUIZ YOUR PARTNER

- Choose a rod to represent 1 whole. Quiz your partner on values of different rods.

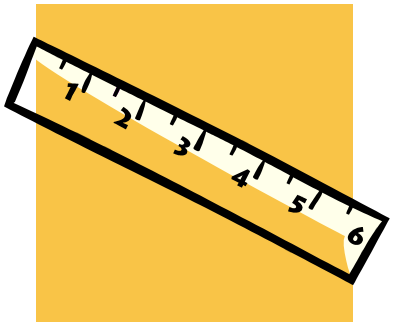
- Challenge yourself to use rod lengths other than white or red for the whole.

WHOLE TO FRACTION… FRACTION TO WHOLE

Whole Unit to Fraction/Fraction to Whole Unit

	**CARD A** **Each of these is a whole.** **Partition each whole into fourths.**	
		

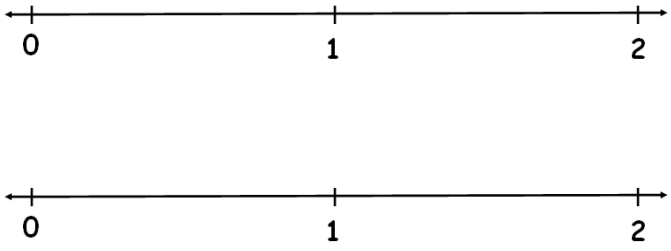
EQUIVALENT FRACTIONS



Relate equivalent fractions as being equivalent because they measure the same distance from zero on the number line.

PLACEMATS FOR EQUIVALENT FRACTIONS

Equivalent Fractions
Using Number Lines



Equivalent Fractions
Using Rectangle Areas

(Each rectangle equals 1 whole unit)

Equivalent Fractions
Using Pattern Blocks

Represent 1 whole unit	Represent first fraction	Represent equivalent fraction

Equivalent Fractions
Using Relationship Rods

- Represent 1 whole unit
- Represent the first fraction and the equivalent fraction
- Line the rods up to prove equivalency
- Label each row

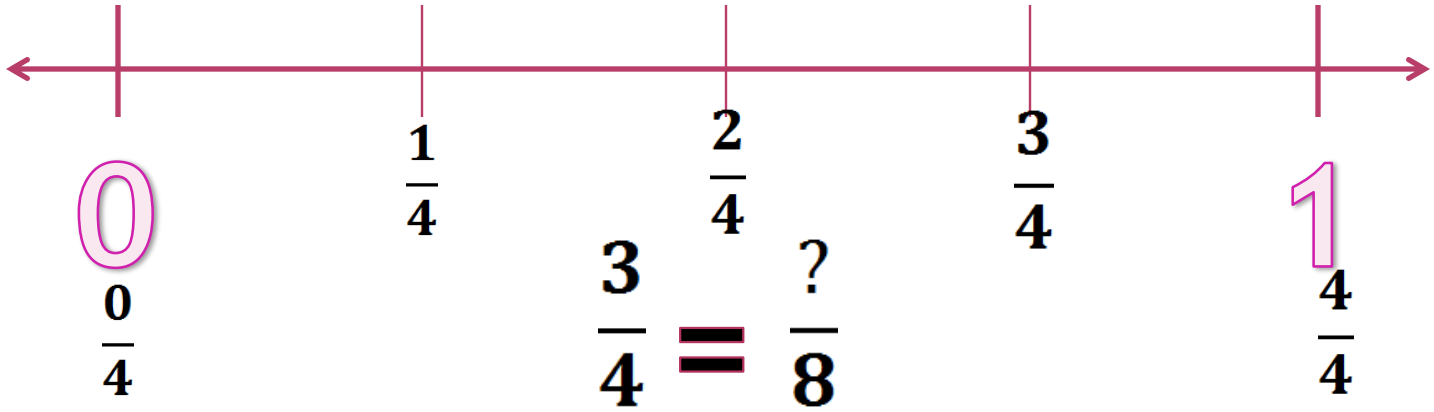
EQUIVALENCE

- Show $\frac{1}{2}$ with the number line.
- Show $\frac{1}{2}$ with the Cuisenaire rods.
- Show $\frac{1}{2}$ with pattern blocks.
- Show $\frac{1}{2}$ with the area model.

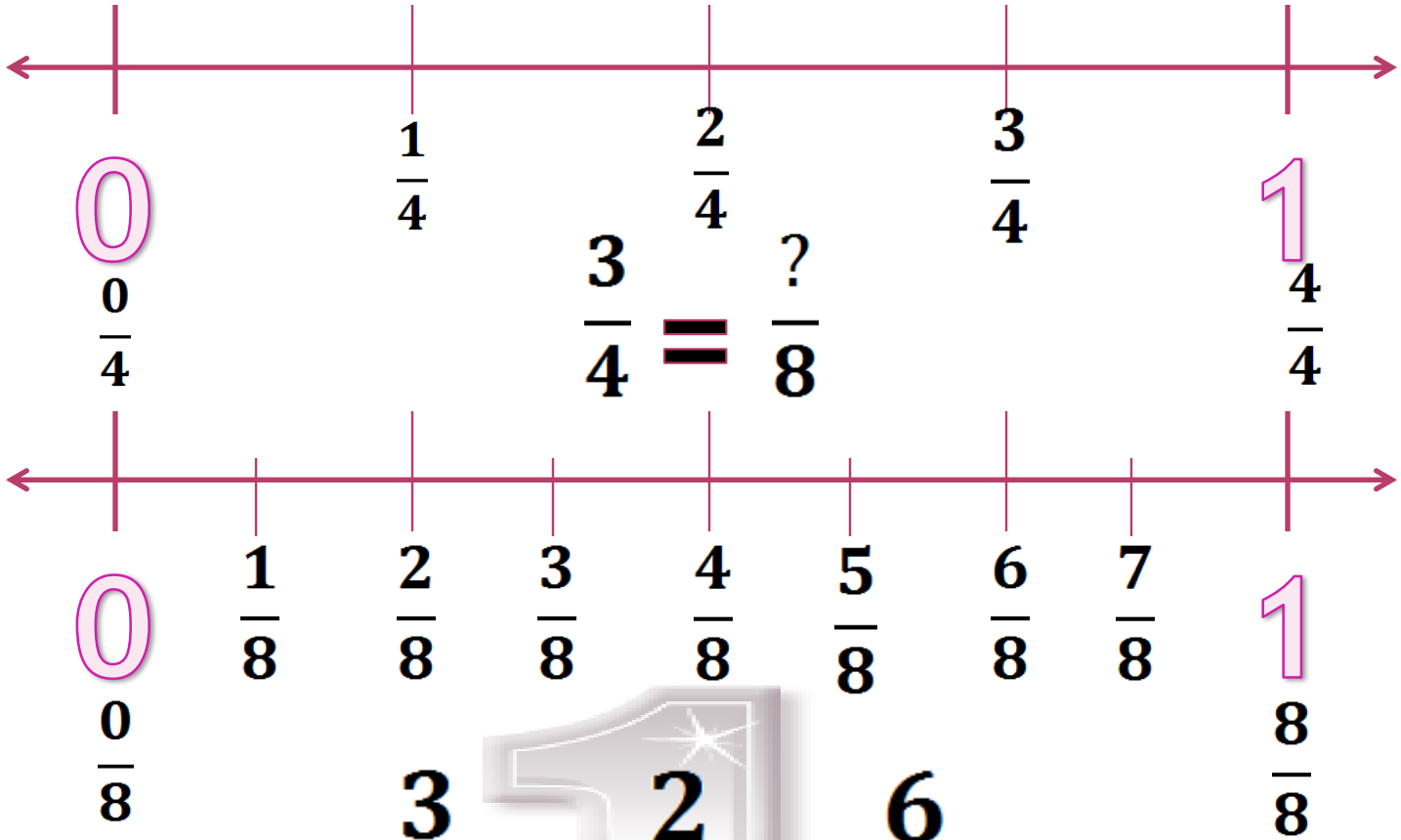
USING DIFFERENT TOOLS TO MAKE EQUIVALENT FRACTIONS

- Each person will be working the same problem.
- Each person will be using a different tool.
- Each person will use a different tool to demonstrate that two fractions are equivalent.
- Each person will share their process with table partners.
- Each person will sketch all 4 methods for used for finding equivalencies on their recording sheet.
- Then rotate the placemats within your group, and show equivalency for next fraction pair.
- Even though each tool is different, consider how each person's thinking was similar in order to prove that the fractions were equivalent.

MULTIPLYING BY THE BIG ONE



MULTIPLYING BY THE BIG ONE

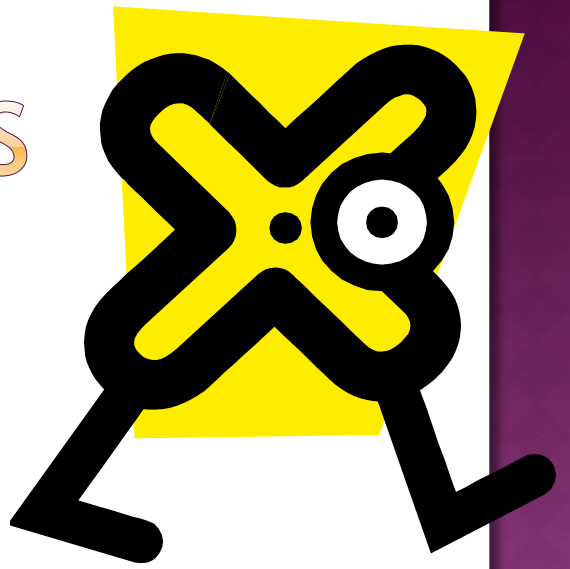


$$\frac{3}{4} \times \frac{2}{2} = \frac{6}{8}$$

MULTIPLYING BY THE BIG ONE

- So what does multiplying by the Big One have to do with each tool that you used to make equivalent fractions?

EQUIVALENT FRACTIONS



Use your Multiplication chart as another tool to make equivalent fractions.

Equivalent Fractions

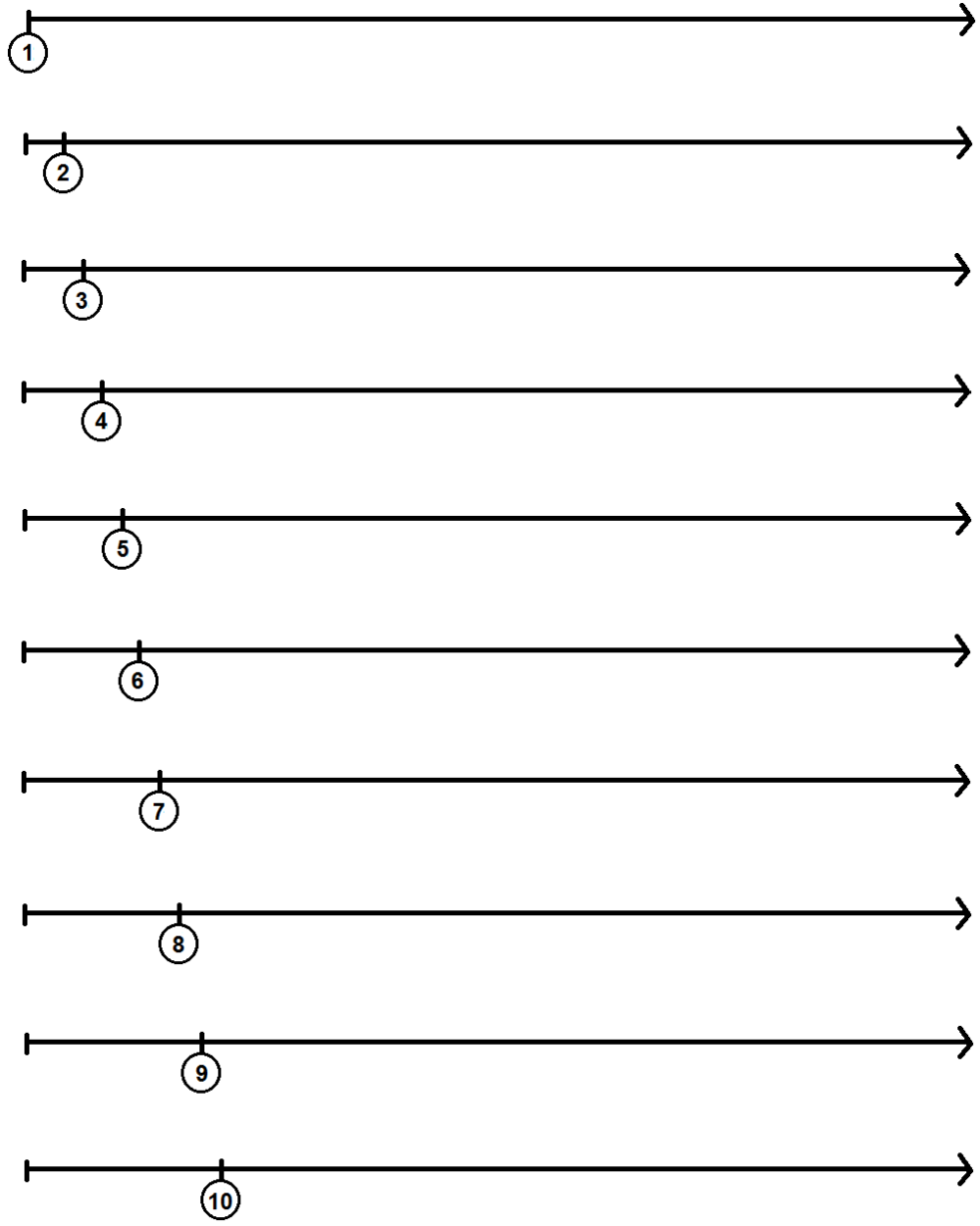
X	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60

Equivalent Fractions

X	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60

Equivalent Fractions

X	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60


1
2
3
4
5
6
7
8
9
10

I HAVE….WHO HAS?

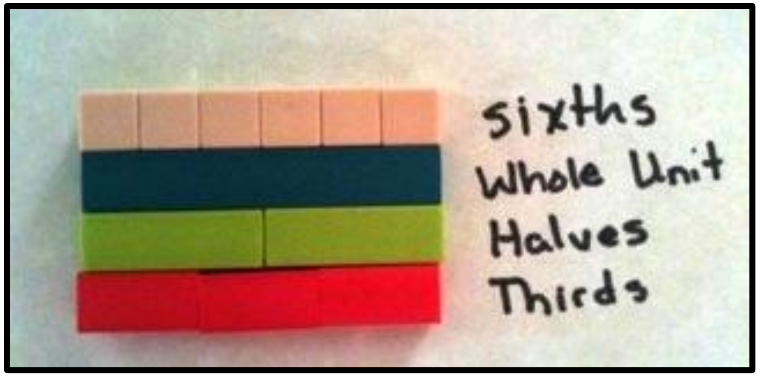
- Deal out all cards.
- The person who has the first card begins, sets the card down, and asks the question.
- Whoever has the equivalent fraction lays the next card down, reading what is on that card and asking the question.
- Time yourself.
- After your group gets all the way through the cards, reshuffle, play again, and try to beat your own time.

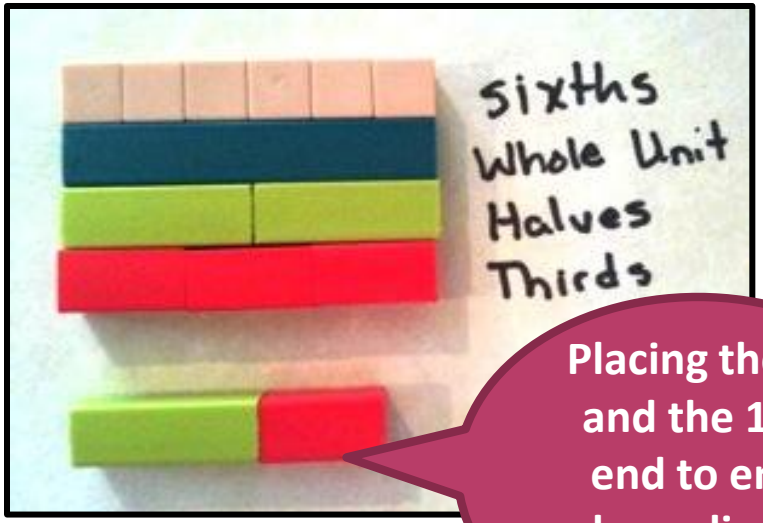
ADDITION PROBLEM

- **Jeremy had ½ of a whole pizza left. Susan had 1/3 of a whole pizza left. They put all of their pizza together in one pizza box. How much of a whole pizza did Jeremy and Susan have all together?**
- **Important…. The whole pizzas were originally the same size.**
- **Important…..The question is asking what fractional part of a whole pizza they have now…not what fractional part they had of the original amount (which was two pizzas).**

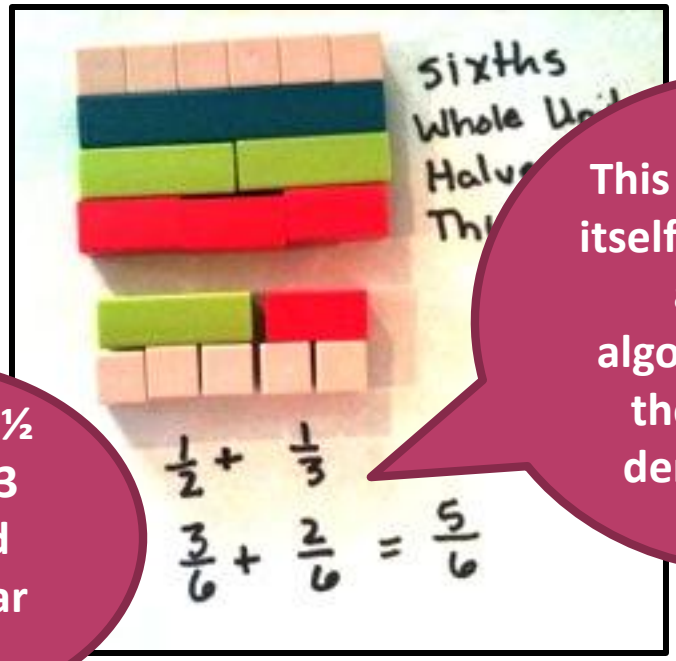
ADDITION

- To represent the problem ½ + 1/3, students must find a rod that can be partitioned into both halves and thirds….



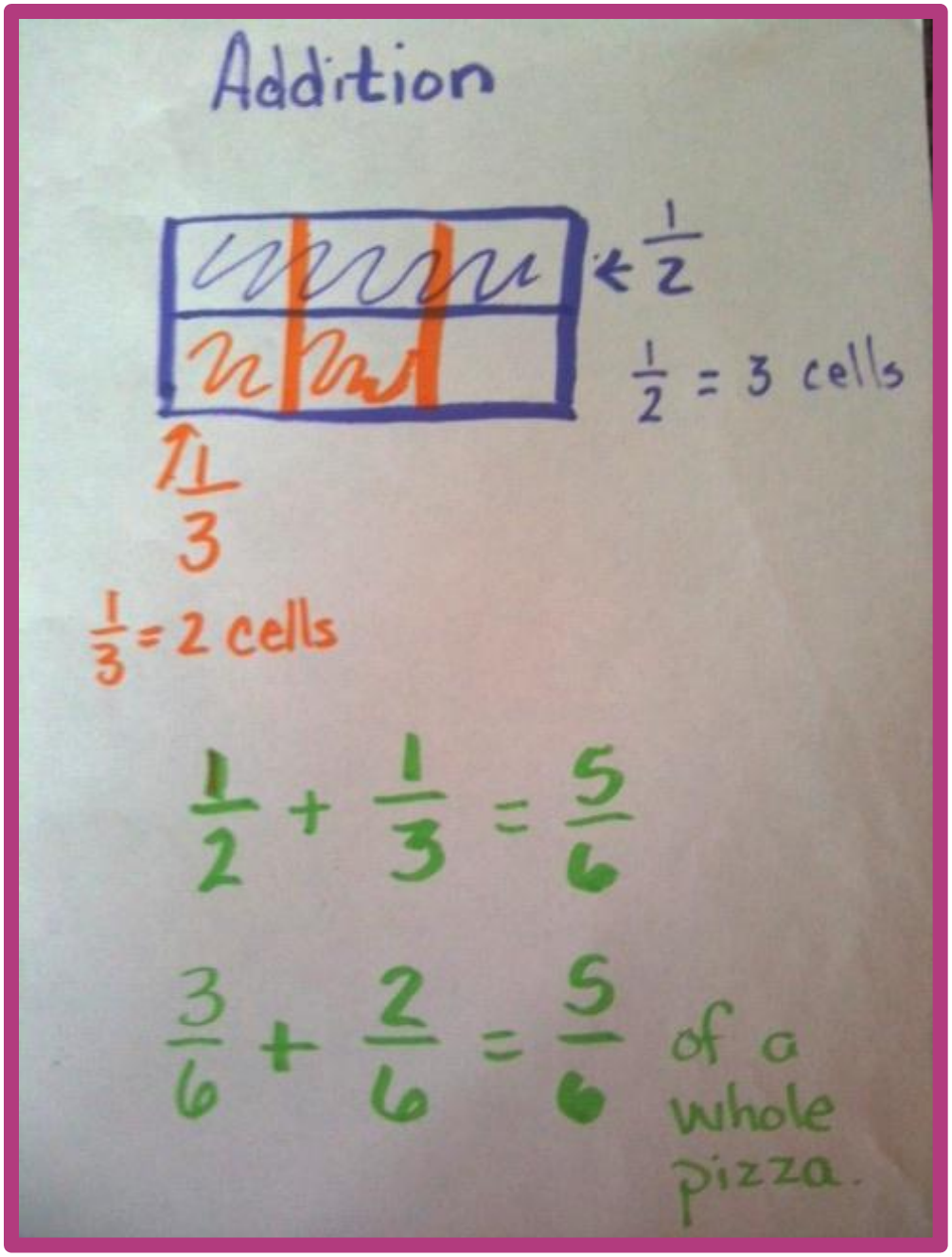


Placing the ½ and the 1/3 end to end shows linear addition.



This model lends itself nicely to the addition algorithm using the common denominator.

AREA MODEL


Addition
1/2
1/2 = 3 cells
1/3
1/3 = 2 cells
1/2 + 1/3 = 5/6
3/6 + 2/6 = 5/6 of a whole pizza.

ADDITION PROBLEMS

- Jennifer ate 1/3 of a whole pizza for lunch and 1/4 of the same size pizza for dinner. How much of a whole pizza did she eat today?

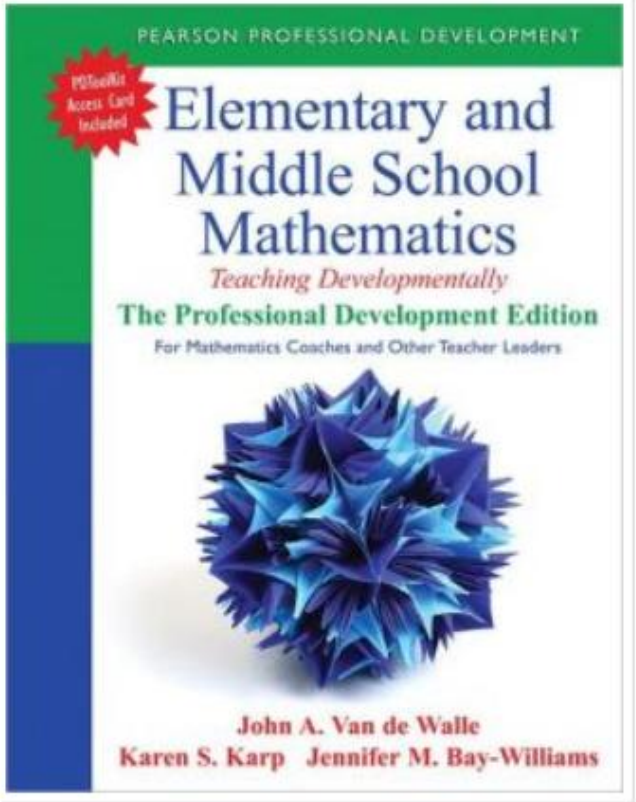
MORE ROD MODELS

- Intro
- http://mediasite.missouristate.edu/fctl/Play/6dd234191ecd4c9ebed2fb747506b13d1d
- Addition
- http://mediasite.missouristate.edu/fctl/Play/f2e979d6ae0446dea1b8b26e3021142e1d

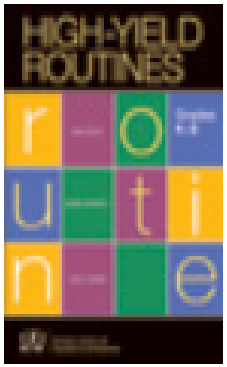
OUR MAJOR SOURCE

Elementary and Middle School Mathematics: Teaching Developmentally: The Professional Development Edition / Edition 1

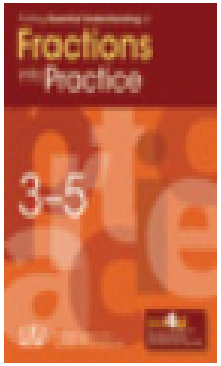
by John Van de Walle, Karen S. Karp, Jennifer M. Bay-Williams



OUR SOURCES



High-Yield Routines for Grades K-8



Putting Essential Understanding of Fractions into Practice in Grades 3-5

THANKS FOR BEING HERE….

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